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Higher Oil Prices Reflect Improvement

Highest production in 1931, week ending Aug. 8, average daily output 2,551,807 bbls. Peak of U. S. production, week ending Aug. 24, 1929, average 2,975,435 bbls.

Present Upward Trend Should Continue. Crude Situation in Good Shape. Refiners Must Curtail Runs

By Andrew M. Rowley

Lowest daily average crude oil production in the United States during 1931 was for week ending Sept. 5 with average output of 1,736,007 bbls.

Higher prices for crude oil in Oklahoma and Kansas, effective April 1, coupled with a steady strengthening of the gasoline market during the past week have given a rosier tinge to the outlook. The advance in prices, while expected, was tangible evidence to the industry conditions have improved and are continuing to improve.

There is no excuse for the low prices which have prevailed in the crude and refined oil markets and every reason why the present upward trend should be continued. Much depends on refiners. If they will curtail their runs to stills and manufacture just a little less gasoline than their actual requirements, the gasoline market will continue to strengthen and there will be no distress product on the spot market to affect the price structure. As gasoline prices advance to a reasonable level, crude oil prices will be adjusted on a proper differential.

It has taken many oil men a long time to realize the difference between "potential production" and what a field can actually produce over a period of time. A new term was introduced to the industry at the convention of geologists last week when "critical production" was discussed. The significant and encouraging feature is the fact more and more companies are becoming convinced "potential production" means little or nothing and that the only figure which should be considered in any study of conditions and any survey of the future is that figure which represents what a field can produce safely and without endangering the properties. There is quite a difference between a potential production of 10,000,000 barrels daily at Oklahoma City and a critical production of 200,000 barrels or less daily. Yet, based on the best engineering study of conditions, the latter figure is correct and the figure on potential meaningless except as a measuring stick on which to base ratable output.

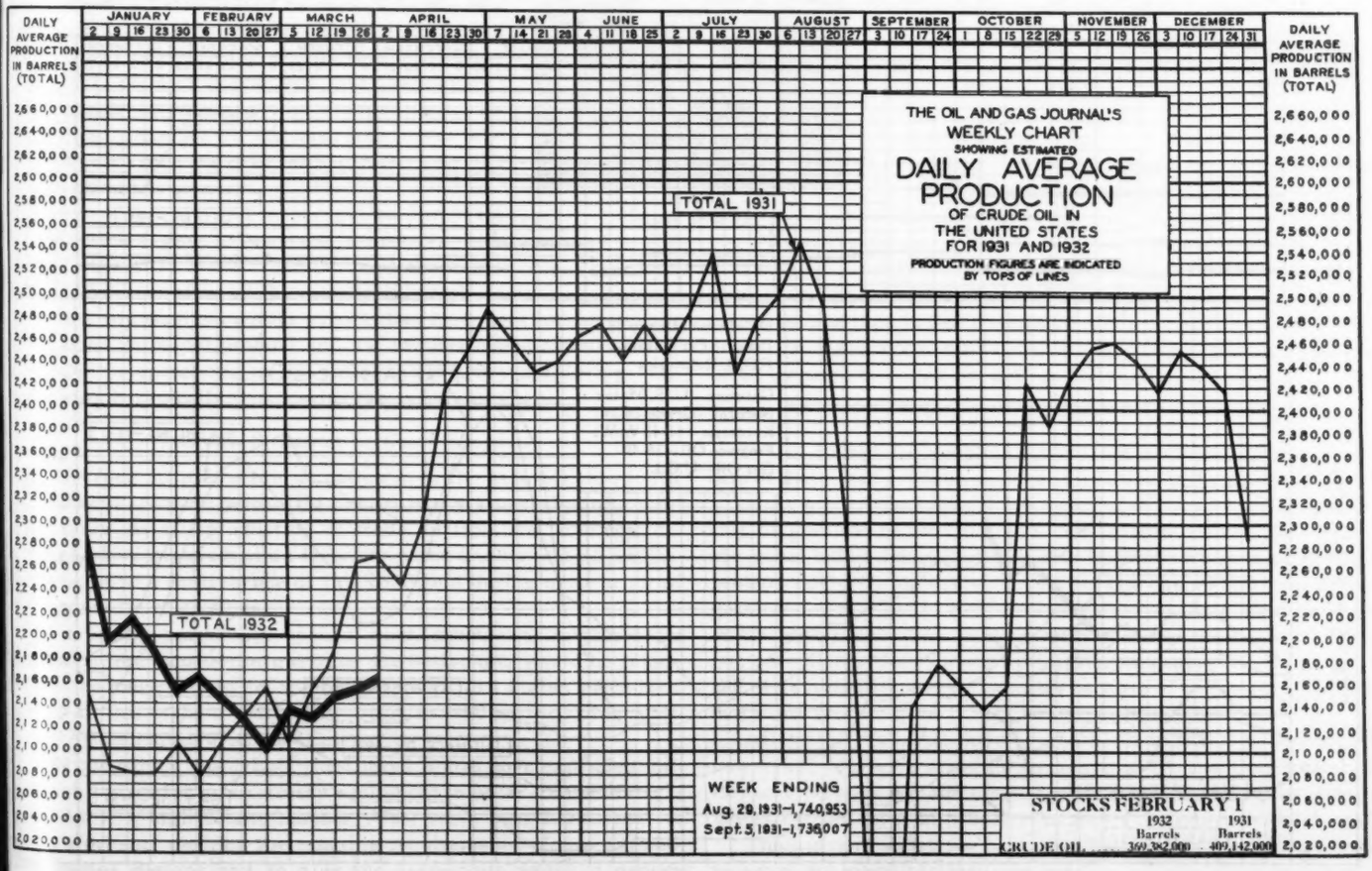
The initial step has been taken towards a price level which will permit all to operate at a reasonable profit instead of a loss. This movement should have the wholehearted support of every person in the oil business.

PRODUCTION IN THE UNITED STATES

Estimated daily average production of crude oil in the United States for the week ending March 26, and a comparison with the previous week follows:

	Mar. 26	Mar. 19
Oklahoma—		
Oklahoma City	111,705	91,405
Seminole-St. Louis	117,305	121,065
Remainder of State	206,410	208,060
Total Oklahoma	435,420	420,530
East Texas—		
Kilgore	102,159	102,141
Lathrop	119,677	119,873
Joiner	105,910	107,550
Total East Texas	327,746	329,564
West Texas	174,455	179,796
North Central Texas	74,596	74,763
Texas Panhandle	46,748	47,035
East Central Texas	55,260	55,112
Gulf Coast Texas	103,536	101,520
Southwest Texas	59,825	58,046
Total Texas	842,166	845,836
Kansas	98,525	99,245
North Louisiana	27,905	27,280
Gulf Coast Louisiana	28,312	26,105
Arkansas	34,145	34,135
Eastern fields	113,000	114,000
Rocky Mountain area	86,348	81,587
California—		
Santa Fe Springs	65,000	66,500
Long Beach	79,500	81,000
Playa Del Rey	19,250	19,250
Elwood	15,750	16,250
Kettleman Hills	56,750	63,000
Remainder of State	256,750	261,000
Total California	493,000	507,000
Total United States	2,158,821	2,155,718

→ Increase 3,103 Bbls. Daily ←



Broad Advance in Oklahoma Quotations

Gasolines, Kerosene, Tractor Fuels, Furnace Oils Share in Price Increases. Bright Stock Quotations Up 2 Cents

By C. O. Willson

The Oklahoma (Group 3) tank car market on refined products advanced over a broad front during the past week. The price increases included one or more grades of refinery gasolines, natural gasolines, gas oils, furnace oils, tractor fuels, kerosenes and bright stocks. Those products which did not advance reflected the better feeling in regard to the refined market and quotations were generally firm.

The upward price trend was in part due to the announcements on Thursday of last week that posted schedules on crude oil in Oklahoma, Kansas and part of Texas would be advanced April 1. However, the factors of decreased supply through curtailment of refinery operations and improvement in the demand for some of the products, have pointed to higher quotations on refined products since early in the month and it is certain that many of the price increases would have materialized if no announcement of crude oil advances had been made.

In regard to the proposed advance in posted crude oil prices most refinery operators are "marking time." At this writing, there was no assurance that higher schedules announced by four or five large and small buyers would receive sufficient support from other purchasers to become generally effective in the Mid-Continent at the start of the new month. Unless the higher prices are accepted by purchasers buying the bulk of the crude oil production not only in the Mid-Continent but also competitive areas in the Gulf Coast, Middle West and Rocky Mountain, it is assumed that the effective date for the higher schedules will be postponed.

Refined markets are so highly competitive that it is not believed that any company or refining area can afford to pay what would amount to a premium for crude oil supply if the higher schedules are not generally adopted by all refiners and crude oil purchasing companies.

Refinery Situation Strong

The proposed new crude prices are 15 cents higher than present schedules. Market observers agree that if they become effective April 1 they will serve as an additional impetus for higher prices on all refined products. At the same time they do not look for any reactionary trend in present refinery prices should the higher crude schedules not become effective and present prices continue. In other words, it is believed that the refinery market is slowly moving toward a stronger price situation regardless of what happens in the immediate future in the crude oil situation.

The March advances in refinery prices have not been sufficient to place most refinery operations on a profitable basis. The owners had hoped that the market would continue to strengthen so that this situation would change by early April and they would then start a spring and summer period of operation in which they would recoup some of their losses of the winter's operations. A 15-cent advance in crude oil schedules obviously will necessitate higher refinery prices than are now necessary to bring about profitable operations.

In this connection, it has been pointed out that the substantial curtailment in plant operations that have been made effective by a large number of refiners throughout the entire country in order to prevent the winter accumulation of excess gasoline and other refined products has tended to emphasize the need of better refinery prices.

Most refiners when they curtail their refinery operations cannot make corresponding reductions in plant operations and sales costs. This is also true in cases where refiners have made complete shut downs of all or some phase of their operations. Labor costs continue with little change when plants are operating part capacity and depreciation, maintenance, interest on investment and other charges against operations are practically the same. This decrease in efficiency due to reduced volume obviously must be offset with better prices for the finished products or otherwise the operator cannot justify the curtail-

(Continued on Page 156)

REFINED MARKET BAROMETER

Advances in refinery tank car prices over the past week were more general than during any similar period in several months. Except for the West Coast, increases in quotations materialized in one or more products in all refining areas. Refinery gasolines were stronger and prices were advanced. Higher postings for crude oil and advances in tank wagon and service station prices throughout the East and Southeast aided the refinery market. Natural gasolines advanced in the Mid-Continent. Kerosene quotations were generally higher in the domestic market and a steady demand for tractor fuels and furnace oils was reported in all refining areas. Bunker fuel oil advanced 5 cents at coastal points with gas oils stronger. Bright stock prices advanced in Mid-Continent and Pennsylvania. Neutral oils firm. No change in wax.

Mid-Continent—Refinery gasoline and natural gasoline prices advanced in all areas. Kerosene prices higher in Oklahoma and Kansas. Quotations on furnace oil and gas oil generally higher. Fuels strong in Oklahoma. Bright stock quotations advance. Wax unchanged.

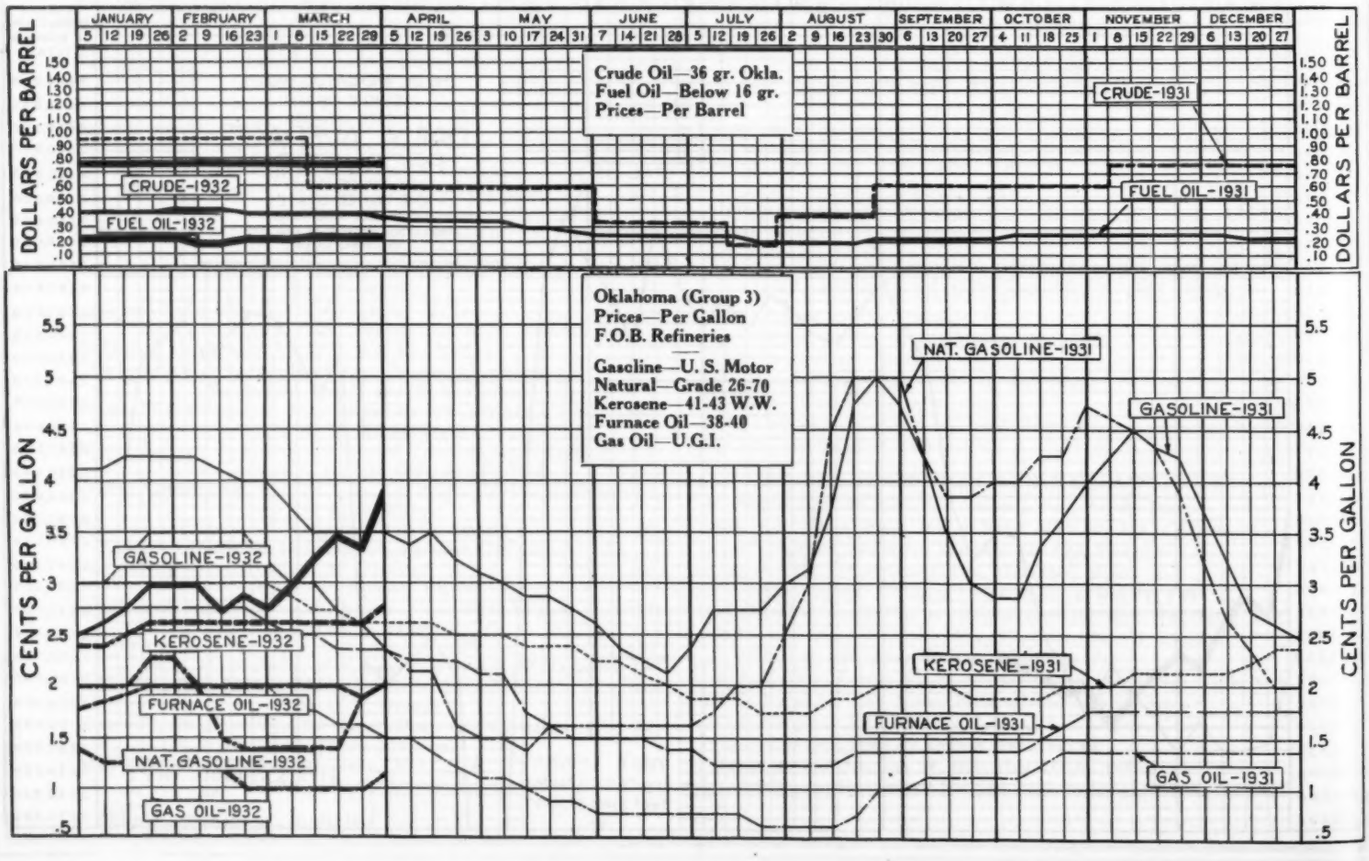
East Coast—Refinery gasolines stronger. First advance in bunker fuel oil which has been selling at lowest levels in history of industry. Gas oil firm. Price trend in kerosene upward. Lubricants and wax firm.

Pennsylvania—Refinery gasoline prices advance. Kerosene and fuel oil prices higher. Advances in some grades of bright stock and neutral oils.

Chicago—Gasoline and special naphtha prices higher. Better demand brings fractional price increases in kerosene, tractor fuel and furnace oil. Fuel oil steady.

Gulf Coast—Gasoline and kerosene stronger. Advances in some grades of pale and red oils. Fuel oil prices higher.

California—Better movement of gasoline. Kerosene steady.



Continental Raise Constructive Move

All Business in United States Must Eliminate Present Practice of Selling Products at or Below Cost of Manufacture

By Andrew M. Rowley

The announcement made on March 24 by the Continental Oil Co. that, effective April 1, it would increase the price it pays for crude oil it buys in Oklahoma and Kansas 15 cents a barrel, is one of the most constructive moves made in the petroleum industry in recent years.

Daniel J. Moran, president of the Continental, believes the most necessary step to bring all business in the United States to a sound footing is to eliminate the present practice of selling products at or below the cost of manufacture. This practice has spread throughout the Nation and in all lines of business. Salesmen have been told to get orders regardless of prices. The result has been a steady, downward trend in the general price structure, with additional discounts allowed here and there, until the net return to the manufacturer has been less than the actual cost of manufacturing the product.

No business has been free from this evil. In many cases sellers have allowed additional discounts. Buyers, sensing this situation, have threatened to switch their business from old, established channels to concerns willing to sacrifice profits for business.

Daniel J. Moran

Cause of Losses Conceded

It is conceded the millions of dollars lost by oil companies last year was the direct result of low prices for crude oil, gasoline and other refined oil products. Knowing and admitting the cause of these enormous losses, it naturally would be supposed every oil man would co-operate to the best of his ability to eliminate this cause and to bend every effort to return the oil business to a higher price level basis of operations. But there still is considerable inconsistency in the petroleum industry and there are oil company executives who feel the price increase to be made effective April 1 "is premature."

The oil industry will never get to first base until it stops trying to convince itself and others that "It Can't Be Done." Seldom have the causes of an industry's troubles been so plain or the remedy so simple.

When any business enjoys a more than 2 per cent increase in the sales of its principal product and yet records losses of millions of dollars in its operations, as the petroleum industry did during 1931, something is radically wrong with the system in vogue.

Crude Situation in Good Shape

The crude oil production situation is in the best position it has experienced in many years. No one with any knowledge of conditions fears any overproduction of crude oil from any area now developed. In fact, production is below requirements and all indications point to a continuance of this condition during most or all of the remainder of this year.

The spring season has opened when substantial increases are assured in the demand for gasoline. No better time could be selected for the movement to get the industry back to a higher price level where all can make a reasonable profit instead of recording additional losses month after month.

Oil companies throughout the United States have expended millions of dollars for new refinery equipment in order to manufacture gasoline of a high octane number. Vast sums have been spent to make a product meeting the exacting requirements of new automobile engine designs and to give the automobile owner a quality gasoline which will meet his every need. Standard gasoline brands have been advertised throughout the Nation until every automobile driver is familiar with the trade names of numerous of the leading companies.

Yet, after the oil companies have spent millions of dollars to make this superior gasoline and to bring it to the attention of automobile owners, what do they do? Base their prices for this high grade gasoline on the prices asked by the operator of some little skimming plant or tin can refinery whose gasoline 90 per cent of automobile owners in the United States refuse to put in their cars.

Companies Sacrifice Profits

They sacrifice profits and operate on a loss in a vain effort to get gallonage. I say "vain effort" because more than 90 per cent of the gasoline sold in the United States is the product of established companies making a high-grade product and this business will always go to those companies making this superior gasoline because the American automobile owner has sense enough to know a good gasoline is cheaper in the long run. Automobile owners never have complained about gasoline prices and, personally, I don't believe the price of gasoline has any effect whatever on consumption.

Mr. Moran feels the sales departments of the oil companies have not received due consideration from executives when changes in crude oil prices are contemplated. The sales departments should be given ample time to adjust their business to new price schedules. Hence the idea of announcing the present increase in price in advance of the date on which it becomes effective. By April 1, gasoline prices, that is, net back to the refiner, should be in line with the new crude oil prices. Such a plan, if successful, will prevent losses incurred when crude oil prices are not in proper relation to the returns from gasoline.

Refiners throughout the country should curtail their runs to stills to the point where there will always be a healthy demand for more gasoline than is being manufactured. This will permit a withdrawal from storage and will absorb any distress gasoline manufactured by any refiner in need of cash quickly.

Should Meet New Prices

Prices quoted for gasoline should not be based on one or two cars of distressed product, such as quite often is the case. Frequently a refiner will advise half a dozen or more brokers he has one or two cars of gasoline he will sell at a certain price, which, probably, is somewhat below the general market. Immediately each of these six brokers advises prospective buyers he has one or two cars each of gasoline for sale and the impression is created there are 6 or 12 cars of this distress product on the market, whereas there is only one or two cars. Often the published price in newspapers is a reflection of the price asked for one or two cars because of the impression many more cars are involved.

All major crude oil buyers should act quickly in meeting the new crude oil price schedule inaugurated by the Continental Oil Co. and refiners should take prompt action in bringing gasoline prices up to a level in proper relation to the new prices for crude.

The industry must get back to a higher price level if it wants to avoid the losses suffered last year.

"Critical Production" Is New Oil Term

Addition to Terminology Introduced at Annual Meeting of Association of Petroleum Geologists in Oklahoma City

By L. G. E. Bignell
Petroleum Engineering Editor

A new term, "critical production," was given to the oil industry at the seventeenth annual meeting of the American Association of Petroleum Geologists, held in Oklahoma City, March 24, 25 and 26. L. P. Garrett, president of the Association, who introduced the term, defined it as "the maximum amount of oil that can be produced from a pool or property per day under a systematic program that will give rise to the cheapest lifting cost for all oil in the pool during its lifetime."

The Oklahoma City Geological Society was host to the 899 members of the association who were registered. The meetings were held in the new Hotel Biltmore, with technical sessions of associated organizations in the Huckins Hotel. J. F. Owens, of the Oklahoma City Chamber of Commerce, gave an address of welcome. President Garrett in his response said:

"As the oil industry has grown increasingly competitive and increasingly essential to our national commerce, a demand has been made upon our association by the industry to not only increase efficiency in prospecting but also to lower mining costs, and the oil industry has looked to its engineers for better and more efficient equipment, and to the members of our association for facts that would assist in production methods. Within the last two years many of our members have given the question of how best to lower the lifting cost of oil a great deal of study, and the more we study it the more we find that the value of a pool or property is dependent upon the cost of lifting oil for the life of the property, and the work of geologists for the last two years is pointing to the fact that as new pools are discovered the industry may be much more concerned with the critical production that may be obtained from such pool or property than with its potential production for any one day or more.

Instead of "Potential Production"

"By critical production is meant the maximum amount of oil that can be produced from a pool or property per day under a systematic program that will give rise to the cheapest lifting cost for all oil in the pool, during its lifetime. Thus the new standard of estimating the available oil in a new field for any one period may substitute the word critical production as previously defined, for the much misunderstood term potential production, which has been the standard of the industry.

"This work on the study of the best method to lower mining costs is now in its pioneer stage and it is too soon to predict what our final conclusions will be, but it should be extremely gratifying to all of us to know that our membership is keenly alive to the problem, that it is really making progress with the problem, and that the membership is adjusting itself into what may become one of the most important transitions in the oil industry."

OFFICERS ELECTED BY GEOLOGICAL SOCIETIES

New officers of American Association of Petroleum Geologists and allied societies elected at annual meeting in Oklahoma City, Okla., March 24, 25 and 26 follow:

Dr. Frederic H. Lahee, president, chief geologist Sun Oil Co., Dallas, Tex.

Robert J. Riggs, vice president, chief geologist Indian Territory Illuminating Oil Co., Bartlesville, Okla.

William B. Heroy, second vice president, in charge of finance, Sinclair Exploration Co., New York City.

Ralph D. Reed, third vice president in charge of editorial work, The Texas Company, Los Angeles, Calif.

L. P. Garrett, past president, Gulf Production Co., Houston, Tex.

Officers of Division of Paleontology and Mineralogy (Society of Economic Paleontologists and Mineralogists), are:

G. Dallas Hanna, president, California Academy of Sciences, San Francisco, Calif.

James A. Waters, vice president, Sun Oil Co., Dallas, Tex.

Gayle Scott, secretary-treasurer, Texas Christian University, Fort Worth, Tex.

Raymond C. Moore, editor, University of Kansas, Lawrence, Kans.

Charles E. Decker, past president, University of Oklahoma, Norman, Okla.

Officers of Society of Petroleum Geophysicists follow:

Paul Weaver, president, Gulf Production Co., Houston, Tex.

Gerald H. Westby, vice president, Empire Oil & Refining Co., Bartlesville, Okla.

John F. Weinzierl, secretary-treasurer, consulting geologist, Dallas, Tex.

Donald C. Barton, editor, consulting geologist, Houston, Tex.

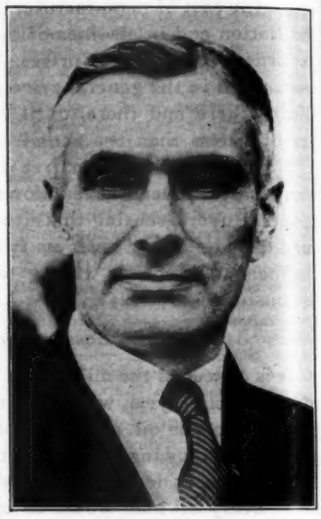
It was interesting to note as the 100 papers were presented how clearly Mr. Garrett had struck the keynote of the major portion of the discussions. Economics of geology and engineering were stressed in most papers and instead of dealing with the technical side of geology more thought was given to the critical production factor as outlined by Mr. Garrett.

In the first technical session, Ira H. Cram, Pure Oil Co., Tulsa, discussed the Structural History of Seminole Uplift in Oklahoma, and traced the development of the geological characteristics of this region.

Papers on the Oklahoma City Pool were delivered by W. W. Clawson and D. A. McGee, "Geology and Development of Oklahoma City Field," and L. L. Foley, Mid-Kansas Oil & Gas Co., Tulsa, "Tectonics of Oklahoma City Structure." These three papers gave valuable information on these important areas much of which will be used in studying oil accumulation in these reservoirs and its future recovery.

East Texas Discussion

In the afternoon session H. E. Minor and Marcus A. Hanna, Gulf Production Co., Houston, Tex., presented a paper on "Geology of East Texas Field," and M. G. Cheney, consulting geologist, Coleman, Tex., followed with one entitled



Dr. Frederic H. Lahee

"East Texas Paleogeography and Oil Migration." Taken together they form an important contribution to the many discussions that have been had on this area and confirm some of the published data on that field.

Mr. Minor and Mr. Hanna stated that they had personally examined 50 cores taken from all parts of the field and had estimated the average saturated sand thickness for the field as 22.5 feet. All cores secured were not representative of complete sections of the zone penetrated by the drill, but it was estimated that the percentage of recovered core to penetration varied from 60 to 80 per cent.

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MEMBERS OF AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS ATTENDING THE SEVENTEE

Refiners to Discuss Specifications

Western Petroleum Refiners Expected to Adopt Own Gasoline Grades at Excelsior Springs. Technical and General Sessions

New specifications for gasoline will be a feature discussion at the annual meeting of the Western Petroleum Refiners Association to be held next week at Excelsior Springs, Mo. It is expected that changes which will have been discussed by the association's technical committee over the past several weeks will receive final consideration at the technical session to be held Wednesday, April 6, and definite recommendations will be made to the association's board of directors, to be made effective in the near future.

The proposed action is the result of objections to present specifications which have been made not only by manufacturing departments of several Mid-Continent companies but also by the sales departments. Although no announcement has been made by the association as to the specifications, it is understood that they will supplement present government specifications with the view of securing more definite classifications than are now possible.

The proposals provide for grades which will be known as W.P.R.A. products in the same sense that the federal specifications are now used and will be used as the basis for open market and contract sales between Mid-Continent refiners and their customers throughout the Southwest and Middle West.

The greater attention being paid to octane ratings has been largely responsible for many refiners advocating that the association adopt specifications. The Mid-Continent trade now recognizes three grades of U. S. Motor gasoline and three grades of the 60-62, 400 endpoint gasoline. One grade covers gasolines of U. S. Motor specifications under 57 octane, a second between 57-65 octane inclusive and a third grade above 65 octane.

The manufacturing group of the association, it is understood, proposes to continue these three grades as to octane ratings with additional specification not now required in the U. S. Motor grade.

One specification which will be brought up for consideration at the Excelsior Springs meeting is the color requirement. Color is not included in the government specifications but there is a strong support for its inclusion in the association's specifications. It is claimed that some refiners are no longer attempting to meet the usual specifications as to color and also odor, working a hardship on a majority of refiners who continue to refine a water white grade of 30 color. In some refinery operations treating pressure distillates and finished gasoline to assure stable color and sweet odor results in a substantial reduction in octane rating of the finished motor fuels. By not observing these specifications the cost of the refinery operations is less and the sellers are able to dispose of their products in the middle or premium octane grades in competition with refiners whose costs are substantially greater due to the fact they continue to meet the usual requirements as to odor and color.

Vapor pressure and distillation range will also be discussed at the annual meeting and it has been suggested that some deviation be allowed from present government specifications in the grades to be adopted by the association.

The discussion on gasoline specifications will be led by H. W. Camp, general superintendent of refineries for the Empire Oil & Refining Co. L. E. Eldridge of the Shell Petroleum Corp. will lead the discussion of specification for western cylinder stocks and motor oils which will also receive consideration at the annual meeting. Opportunity will be given for all refiners to take part in the discussion before any final action will be taken in regard to the specification changes.

The opening technical session will start Wednesday afternoon. A second session will be held Thursday morning. A. S. Hopkins, vice president of the Standard Oil Co. of Kansas and chairman of the technical group, will preside. In addition to the discussion of specifications there will be a number of other subjects discussed which will be of interest to those connected with operations of refineries, including research and development departments.

General Sessions

The first general session at the annual convention will be held Thursday afternoon, April 7. This meeting will be attended by refinery executives from the Mid-Continent and other refining areas.

L. R. Crawford, president of the Producers & Refiners Corp., Independence, Kans., will open the meeting as president of the association. Mr. Crawford has been president of the association over the past two years and has announced his intention not to accept re-election at this year's meeting.

Developments in cracking and the trend in gasoline specifications with special reference to octane ratings will be discussed at the Thursday meeting both from sales and manufacturing ends. The Diesel engine development will be discussed by S. A. Guiberson, Jr., and F. R. Martinek of the Standard Oil Co. (Indiana), who has been active in the campaign to eliminate gasoline tax evasion, will address the executives on effect of evasion from the standpoint of the refiner.

The Friday morning meeting will be largely devoted to the discussion of marketing problems. The annual election of officers will take place at that time.

TWENTIETH ANNUAL MEETING

WESTERN PETROLEUM REFINERS ASSOCIATION

Elms Hotel, Excelsior Springs, Mo., April 6, 7 and 8

TECHNICAL SESSION—1 P.M., APRIL 6

Opening remarks: A. S. Hopkins, Standard Oil Co. of Kansas, chairman.

"Construction and Maintenance of Furnace Brickwork," by George P. Reintjes, of George P. Reintjes Co., Kansas City, Mo. Discussion.

"Utilization of Refinery Gases," by H. M. Smith, Bureau of Mines, Bartlesville, Okla.; Walter J. Podbielniak, Podbielniak Analytical and Research Laboratories. Discussion.

"Increasing Octane Values in Gasoline Through Design and Operation of Re-forming Units," by W. A. Goldtrapp, Arthur G. McKee & Co. Discussion.

"The Need for Western Petroleum Refiners Association Specifications," by H. W. Camp, Empire Oil & Refining Co., and L. E. Eldridge, Shell Petroleum Corp.

If able to be present, C. R. Wagner, chief chemist of Pure Oil Co., will make an informal talk on his company's process for conversion of dry gas into gasoline.

MORNING SESSION—9:30 A.M., APRIL 7

"Co-operative Research in the Petroleum Industry," by Dr. Sidney Born, professor of petroleum research, University of Tulsa.

"Recent Trends in Cracking," by S. S. Johnson, Jr., M. W. Kellogg Co.

"The Future Value of Natural Gasoline to the Refiner," by Emby Kaye, Skelly Oil Co.

Further discussion of all papers presented.

GENERAL SESSION—1 P.M., APRIL 7

Opening remarks: L. R. Crawford, Producers & Refiners Corp., president Western Petroleum Refiners Association.

Appointment of committees.

"The Race for Higher Octane Numbers," by B. E. Sibley and L. L. Davis, Continental Oil Co. Discussion.

"A Discussion of the Guiberson Diesel Engine," by S. A. Guiberson, Jr., of the Guiberson Corp. Discussion.

"Recent Developments of Cracking Light and Heavy Oils," by Dr. Gustav Egloff, Universal Oil Products Co. Discussion.

"The Effect of Evasion of Gasoline Tax on the Refiner," by F. R. Martinek, Standard Oli Co. of Indiana.

MORNING SESSION—9 A.M., APRIL 8

Report of nominating committees and election of officers.

Reports of committees on specifications for gasoline and lubricating oils.

"The Determining Price Factor," by W. C. Platt, National Petroleum News. Discussion.

"Marketing Refined Petroleum Products," by R. W. McDowell, Mid-Continent Petroleum Corp.

"Blue Gasoline—Its Place, Its Value, Its Future," by R. R. Irwin, White Eagle Oil Corp.

UAL CONVENTION OF THE ORGANIZATION AT OKLAHOMA CITY, MARCH 24, 25 AND 26

Diesel-Electric Power Plant on Barge

Unique Installation in Southern Louisiana Can Furnish Alternating Current for Drilling and Pumping

By H. G. Dillon
General Engineer, Westinghouse Electric & Manufacturing Co.

Operating conditions in Terrebonne Bay in southern Louisiana, are such that one is reminded of the old refrain, "Water, water everywhere but not a drop to drink." For in this field the wells are located in shallow brackish water that is not suitable for drinking or boiler purposes. Water for boiler purposes is expensive in any field, but the cost is unusually high in this locality, as it must be brought from some distance by means of barges. The Texas Company has placed in operation in this field a floating Diesel generating plant that uses water from the bay for cooling and provides energy for the operation of an alternating current drilling equipment.

Although the plant was designed for the operation of a rotary drilling rig, it is so constructed that it could be used to furnish power to any alternating current load within the capacity of its generating units. It would be possible to furnish power to several small pumping wells at the same time the drilling rig was in operation without overloading the generating equipment.

There are only three wires between the generating plant and the drilling rig and these wires transmit the energy generated in the plant to the drilling rig. The operation and wiring of the equipment at the rig is exactly the same as it would be if central station power were used. The operation of the drilling rig is entirely independent of the operation of the generating plant.

Description of Plant

The steel barge that carries the generating equipment was designed by L. K. Laney, consulting engineer of The Texas Company, and is of striking appearance. As the barge was built for this particular service all of the space has been utilized to best advantage. It carries a small workshop, quarters for two operators, switchboard, and the two Diesel generating units. A view of the interior of the craft accompanies this article.

The Diesel engines are Cooper-Bessemer, 240 horsepower, 514 r.p.m., solid ejection, Diesel engines of a type that has proven highly successful at sea and in handling small industrial plants.

The generators are 219 kv-a., 480 volts, 514 r.p.m., 60 cycle, 80 per cent power factor, 50° C. rise, bracket type generators with damper windings, marine insulation, and direct-connected, 5-kilowatt, 125-volt, compound-wound, direct-current exciters.

The generators are controlled by a three-section switchboard constructed of 1½-inch slate, mounted in the barge directly behind the generators. Two of the panels are identical and carry an oil-circuit breaker, ammeter, voltmeter, ammeter switch, A.C. and D.C. voltmeter switch, synchronizing switch, exciter-field rheostat, governor motor control switch, field discharge switch and watt-hour meter. The third panel carries the carbon pile voltage regulators for both machines, both generator field rheostats, and an oil switch for the lighting circuit. An A.C. voltmeter, D.C. voltmeter, frequency meter and synchronoscope are mounted on a swinging bracket at one end of the switchboard.

The carbon pile voltage regulators are connected in the exciter field circuit and change the excitation of each generator as required to keep essentially constant voltage on the system. This type of regulator is simple and easily understood and has contributed largely to the success of the equipment.

Each generator is connected to the main bus with an oil circuit breaker that provides overload and undervoltage protection to the generator. Power is transmitted from the main bus through a disconnecting switch above the switchboard through roof bushing to the top of the barge and then through the three cables to the drilling rig where it enters a junction box. The leads to the drilling motor and mud pump motors are connected to the main line in this box.

A transformer is mounted above the switchboard which is used to supply lights and auxiliary power to the plant. A separate lighting unit is provided for auxiliary and emergency use.

All of the electrical equipment on both the barge and drilling rig was manufactured by the Westinghouse Electric & Manufacturing Co.

Drilling Equipment

Although the equipment at the drilling rig is exactly the same as would be used with central station power, it may be of interest to list the main pieces of equipment used.

One Ideal 34-26 type B roller-bearing four-speed drawworks.

Two Ideal 7¼x14 type B slush pumps with the V-belt drives.

One Ideal 75-125-horsepower, type A roller-bearing reduction gear.

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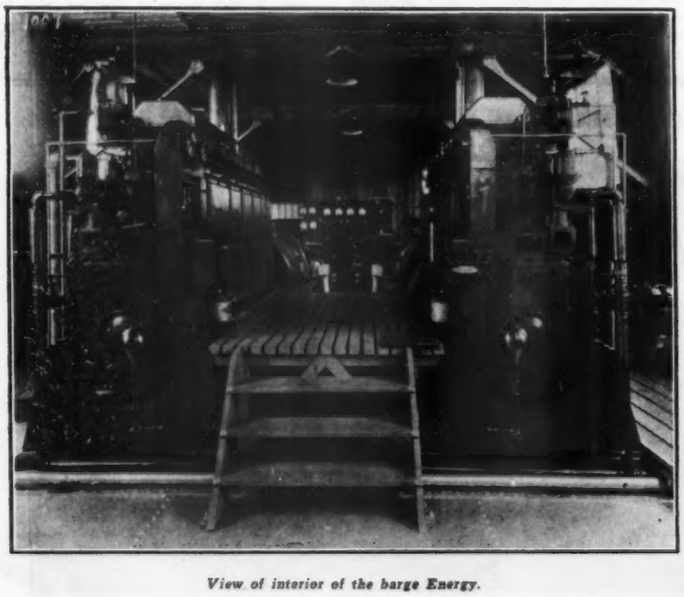

View of interior of the barge Energy.

Fifteen Cent Crude Increase April 1

Continental Oil Co. Leads in Advancing Price on All Grades Produced in Kansas, Oklahoma and North Texas

By James McIntyre

For the second successive time the Continental Oil Co., the headquarters of which is in Ponca City, Okla., has led the way to a substantial increase in the price of crude oil in Kansas, Oklahoma and North Texas. Its announcement, made on Thursday, March 21, was as follows:

"Effective at 7 a.m. on April 1, the Continental Oil Co. announces the following schedule of prices for crude oil purchased in Kansas, Oklahoma and North Texas: Below 29 degrees in gravity, 76 cents; 29 to 29.9 degrees, 78 cents, with 2 cents added for each degree of gravity up to 40 degrees and above at $1."

The Sinclair Refining Co. and Barnsdall Refineries, Inc. announced they would meet the Continental prices in Kansas and Oklahoma. For the balance of the week oil men anxiously awaited announcements that other large buyers had decided to follow the Continental's lead. Their failure to do so was attributed to a decision to wait until a date closer to April 1 before announcing. It was believed that the higher prices will become general on the date named.

The present and the prospective price schedules are as follows:

Gravity—	Present prices	April 1 prices
Below 29 degrees	$0.61	$0.76
29-29.9	.63	.78
30-30.9	.65	.80
31-31.9	.67	.82
32-32.9	.69	.84
33-33.9	.71	.86
34-34.9	.73	.88
35-35.9	.75	.90
36-36.9	.77	.92
37-37.9	.79	.94
38-38.9	.81	.96
39-39.9	.83	.98
40 degrees and above	.85	1.00

The weighted average gravity of crude oil produced in Kansas is believed to be 37 degrees, which would make the average price in that State under the projected price schedule 94 cents. In Oklahoma the weighted average is in the 36-36.9 bracket, which would give the State an average of 92 cents per barrel, while in North Texas an average of 94 cents would prevail.

The last previous crude price advance was made by the Continental Oil Co. on November 2, when it raised all grades 15 cents per barrel.

The April 1 prices thus far do not affect any of the Texas fields outside of the Wichita Falls or North Texas district and in that field only the Continental Oil Co. has posted an advance.

An Innovation

Announcing price changes a week in advance is a new idea in the business of buying crude petroleum, but it is said that Daniel J. Moran, president of the Continental Oil Co., decided on that manner of making price changes in order to permit the refining and marketing end of the industry to prepare for the new prices, which they have not had an opportunity of doing in the past unless they anticipated such a change. Already there has been considerable strengthening of the refined market and there have been advances in filling station prices at many points.

The only other price change announced in the week ending Saturday was by the Stoll Refining Co. of Louisville, which on April 1 will advance Kentucky crude in its lines 15 cents per barrel, making the new price 75 cents per barrel.

With operating expenses cut to the bone, producers in the Kansas, Oklahoma and North Texas fields can "get by" on the proposed prices, but if they were operating their properties on a normal scale of expense, even the new prices would not suffice to make oil producing a profitable business, generally speaking. This is particularly so in the matter of old properties. But it is a step upward and forward and the Continental Oil Co. crept further into the good graces of many oil producers with its announcement of an 18 to 25 per cent increase in crude prices.

Eastern Way of Buying

Recent price changes in the Pennsylvania grade oil fields wherein one field was given a slight increase while two others were given a decreased price were confusing to many oil men who watch crude oil markets. They are not hard to explain, however.

Changes in the price of Pennsylvania grade crude produced in one district only should not be taken to indicate a general change in the Pennsylvania grade crude industry, as various factors enter into the delivered price to refineries. Offsetting a recent increase in Pennsylvania grade crude run to the Buckeye pipe lines in Ohio was a somewhat smaller decrease in the price of Bradford and Allegany districts Pennsylvania grade crude, which is run in the lines of the Tide Water Pipe Co. and the Bradford Transit Co. Refineries located in the Bradford, Pa., and Allegany, N. Y., fields run Pennsylvania grade oil produced in those fields without calling on other producing fields, as a surplus of Bradford and Allegany crude has existed since repressuring of the sands in those districts became extensive. The surplus crude from the two fields is either shipped East or to markets in the vicinity of Oil City as far south as Emlenton, Pa. If too great a surplus exists, the remainder is added to crude stocks.

Refineries located near Oil City, or using that as a focal point, also call upon various Pennsylvania grade producing fields in Pennsylvania, Ohio and

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Three Careers Invited Edward A. Olsen

President of Oklahoma Natural Passed Up Army and Street Car for Utility Management and Has Found No Reason for Regrets

By Thomas F. Smiley

Thirteen years ago three careers, each offering its own peculiar opportunities for the exercise of a life's energies and ambitions, invited the consideration of Edward A. Olsen, now president of the Oklahoma Natural Gas Corp., to-wit:

(1) Street car conductor.
(2) The army.
(3) Public utility management.

He had been a street car conductor and he never has made any clear, unequivocal denial that he was a darned good one. But calling streets, ringing up fares, helping fat women off with their market baskets, and seeing that befuddled homegoers who had passed the night indiscreetly got off at the right place were not duties calculated long to satisfy a nature impatient for action and everlastingly demanding new goals as fast as old ones had been reached. Strike off No. 1.

The army? Well, he had been in the army too, a commissioned officer. You can call him Major Olsen if you want to. But what's the use of being a soldier, even though you have an eagle or stars on your shoulder straps, if it merely means seeing that 17 guns are fired for the governor, receiving salutes of obsequious looies, and saying, "Orderly, my full-dress uniform needs pressing for the ball tonight"? Draw a line through No. 2.

But No. 3? That looks better. The public utility field should satisfy the most voracious craving for work. And goals? Why, you can't see the top one with a telescope. Furthermore, if a fellow has a germinal curiosity to find out whether he has initiative, grasp, vision and executive ability, here's the place to do it. Make it No. 3.

Of course some of the minor details of life had been disposed of prior to this juncture in Mr. Olsen's progress. There was the matter of a birthplace, for instance. That was Milwaukee, Wis. Wauseon, Ohio, or Deaf Smith County, Texas, would have done just as well. It just happened to be Milwaukee, that's all. And it was on October 2, 1893, if you want things dated. He attended the grade schools of Milwaukee, graduated from high school and then studied electrical engineering in Marquette University, Milwaukee. He left the university in his senior year to go to work. He took extension courses afterward at other institutions, this work covering economics, business administration and additional electrical engineering.

First Day as Conductor

Mr. Olsen was 18 when he started to work as a conductor for the Milwaukee Electric Railway & Light Co., and for several years this vocation provided him with employment when he was not in school. A seasoned conductor accompanied him at first of course to coach him and to familiarize him with the streets traversed by his run. That was a great day when he took the street car out with nobody at his elbow to tell him what to do and what not to do. It was with a distinct sense of accomplishment that he entered the carbarn office at the end of the day to turn in his trip sheet and his receipts. The motorman waited outside and then went up the street with him. "Mighty nice of the motorman," thought Ed. "Shows he's interested in a beginner."

The new conductor tried to chat in friendly fashion with the man at his side, but the latter appeared to be only remotely interested and made preoccupied replies. They had walked several blocks when the motorman inquired, "Well, what about dinner?"

"Dinner?" repeated Ed wonderingly.

"Yeah, dinner."

Ed gazed questioningly at his companion, and a dark suspicion began to take form in the motorman's mind.

"Say, you don't mean to tell me you didn't knock down enough fares to buy the eats?"

"Didn't knock down enough to buy a leaf of lettuce," responded Ed. And he added, "I'm not knocking down fares, if you want to know."

"Welfercrisake!" ejaculated the motorman, and in the poignancy of his disgust he walked off muttering.

Served on the Border

Until 1916 young Olsen passed much of his time at the rear end of a Milwaukee street car, devoting most of his other hours to study. In that year he entered the employ of the Commonwealth Power Co. of Milwaukee, later absorbed by the North American Co. His work was in the testing laboratory. Several years before this he had enlisted in Company F, First Wisconsin Infantry of the National Guard, and he scarcely had become well settled in his new position when his regiment was ordered to the Mexican border. He was a first lieutenant at this time. Then came this country's entrance into the World War, and Lieutenant Olsen received a commission as captain of Company B, 107th Field Signal Battalion, 32d Division.

The division was sent to France, where Captain Olsen served until September, 1918, when he was promoted to major and, along with three other officers, was assigned to the 18th Division, then at San Antonio, Tex., preparing to go overseas. The wisdom of assigning seasoned officers to units about to sail had become manifest when the first inexperienced men had gone across and had lost much of their equipment in the confusion attending movement of thousands of soldiers and their supplies. The 18th Division was about to embark for overseas service when the war ended.

Major Olsen was retained in San Antonio, where he established a school for officers and served as its commandant. A few months after the signing of the Armistice he resigned from the army and returned to Milwaukee, entering the service of the Milwaukee Electric Railway & Light Co. as a relay engineer. In this position Mr. Olsen was charged with control of interconnecting transmission systems.

No Memory Training Needed Here

Mr. Olsen has not found it necessary to make an entry in his diary to make sure of remembering one experience. He was at the top of a 40-foot ladder in the Watertown, Wis., substation, 60 miles west of Milwaukee, testing a protective relay, a safety device designed to segregate about 50 cities from the rest of the 66,000-volt system in the event of line trouble making such segregation necessary. He had disconnected the relay and attached his testing apparatus to it when the telephone rang. His helper, standing at the foot of the ladder, answered the telephone and then hurried back to announce: "The transmission superintendent says there's a storm coming and to connect up that relay right away, for the line will be needed."

Failure to replace the relay would mean that the half hundred cities depending on the line would be in semidarkness during the storm. But even before the testing apparatus could be detached the storm had passed into the zone of the transmission line and blue flashes of lightning began to play about the ladder. Each electrical discharge received by the transmission line from the distant storm was carried into the substation, and the ground chain through which these discharges darted from the transmission line into the earth beneath the building leaped crazily this way and that, threatening momentarily to hit the man on the ladder. And if it did hit him—well, there would be an opening for a relay engineer to succeed the late E. A. Olsen.

The assistant demonstrated he was made of good stuff, to the eternal gratitude of the man on the ladder. With a long wooden pole he was fairly successful in holding the ground chain taut. In the meantime young Olsen gripped the ladder with shaking legs, and with a pair of pliers and a screwdriver in his rubber-gloved hands he worked frantically to remove the testing apparatus and reconnect the protective relay.

It Would Make Anybody Nervous

The lightning cracked and sizzled. Lurid shafts of flame danced insanely from one end of the substation to the other. Nobody with the gift of estimating mathematical chances would have taken a 100-to-1 bet that the relay engineer would leave that ladder alive. Ajax might defy the lightning if he wanted to. That was his privilege. But as for Ed Olsen, the one supreme desire of his being was to get that relay back into place. And somehow or other he did it. Only a blurred recollection of how it was done remained in his mind, but that didn't matter. The big thing was that the malevolent crack of the lightning and the hellish bolts of fire had ceased. A pair of trembling legs got him back to the concrete floor again.

Mr. Olsen had been filling this position of relay engineer six months when, in 1920, he joined Day & Zimmerman, utility management and engineering firm of Philadelphia, Pa. This connection gave him just the opportunity he sought for studying and handling the manifold problems of administration and operation of utility properties. At the outset he was made general superintendent of the Arlington Electric Co. and the Alexandria Light & Power Co. (now Virginia Public Service Co.), both operated by Day & Zimmerman. These two companies covered northern Virginia, with heaquarters in Alexandria.

At the end of half a year Mr. Olsen was made assistant general manager of the two companies, his duties now embracing design of plants, construction engineering, valuation of utility properties and preparation of reports looking to increased efficiency in the operation of Day & Zimmerman properties or of properties concerning which that firm had been called into consultation. While engaged in this engineering and construction assignment he built 400 miles of high-tension transmission lines, together with substations and their connection with hydro and steam generating stations. He had charge of the valuation and appraisal of all electrical distribution properties of the Public Service Corp. of New Jersey. Part of his time was devoted to gas and water companies owned by Day & Zimmerman.

This work with the Philadelphia organization, which continued six years,

(Continued on Page 155)

DISCOVERED SOMETHING AS CONDUCTOR

It was back in 1911 when Ed Olsen, 18, was making his first trip as a full-fledged conductor on a street car line in Milwaukee. As he stood on the rear platform he observed that passengers as they alighted or handed him their fares met his eyes and smiled. They hadn't done that when the old conductor assigned to break him in had been in charge. Conductor Olsen wondered about it and arrived at the reason.

E. A. Olsen

He had smiled at the passengers first—smiled chiefly because he was feeling good over being a real conductor—and the passengers were smiling back. That was all.

Other discoveries followed. One was that in the inevitable minor disagreements with passengers he achieved infinitely better results by courtesy and an honest endeavor to be fair than he could by zeal to prove the other fellow wrong.

And so it came about that Conductor Olsen adopted this working formula: "Smile at them and they'll smile at you. Treat them right and they'll treat you right."

Now compare that with the following New Year message which Mr. Olsen sent out to employes of the Oklahoma Natural Gas Corp.:

"Let us resolve to put forth even a greater effort in 1932 to win a full measure of public esteem by courteous treatment of our customers and the public. To gain their good opinion by keeping our promises and overlooking no opportunity of being helpful and by extending ourselves in a sincere manner to prove that we are real neighbors."

More words in it, that's all. Perhaps he didn't realize it, but E. A. Olsen, street car conductor, was developing a philosophy of life for the use of E. A. Olsen, utility president.

Champlin Case Before Supreme Court

Constitutionality of Oklahoma Proration Law and Proceedings Argued at Washington. Case Taken Under Advisement

WASHINGTON, D. C., Mar. 28.—The Supreme Court of the United States has taken under advisement the constitutionality of the Oklahoma oil curtailment statute and the validity of the proration orders of the State Corporation Commission issued under that law. The full day's session of the court was devoted to hearing arguments.

The proration plan of limiting production was characterized by Harry O. Glasser and James M. Beck as "a price-fixing arrangement." It places a burden on interstate commerce, they charged on behalf of the Champlin Oil Refining Co., which challenged the statute and regulations, "and is plainly designed to create monopolistic control of the industry in the executive officers of the producing and transporting branches thereof, which are in turn affiliated with major refining interests wholly outside Oklahoma."

In defense of the statute and orders entered thereunder, W. P. Z. German and John H. Miley, special counsel for the corporation commission, asserted that opposing counsel had "painted a picture far from the facts of the case," and declared that the purpose and operation of the Oklahoma law is designed, first, to prevent waste, and, second, to protect the correlative rights of producers in a common pool where full production is not possible without waste of the available supply of the natural resource.

Mr. Glasser's Brief

The provisions of the statute were explained to the court by Mr. Glasser. Section 2, which he said is conceded to be invalid, prohibits the taking of oil at a time when there is not a market demand therefor at the well at a price equivalent to its actual value. Section 3 declares that the term "waste" shall include "economic waste, underground waste, surface waste and waste incident to the production of crude oil or petroleum in excess of the transportation or marketing facilities or reasonable market demands."

In Section 4 it is proposed that whenever full production from any common source of supply "can only be obtained under conditions constituting waste, as herein defined, then any person, firm or corporation having the right to drill into and produce oil from any such common source of supply may take therefrom only such proportion of all crude oil and petroleum that may be produced therefrom, without waste, as the production of the well * * * bears to the total production of such common source of supply." Provisions for determining the potential capacity of wells, the market demand for oil, and for enforcing the statute are also incorporated in the law. Under these provisions, the Corporation Commission has issued its so-called proration orders, the court was told.

Mr. Glasser maintained that Section 2, though concededly invalid, "is the keystone of the entire statute and is inseparable from its other provisions." He described Section 3 as the "indirect price-fixing plan." The term "market demand," Mr. Glasser contended, has been interpreted to mean "demand at a satisfactory price." "It is upon this provision that the statute has so been enforced," he said.

The orders of the commission issued under the statute, it was alleged, were entered as the result of arrangements agreed upon by an association of the larger oil producers. These arrangements were made, he said, as the result of the effect "of the lengthening shadow of overproductiion on the price of oil." The cooperating oil producers, it was stated, appointed an umpire who was approved by the commission, though paid by the producers, the Oklahoma legislature never having appropriated any funds for the enforcement of the statute.

The cost of the entire proration scheme, Mr. Glasser said, was borne by the operators in the Seminole Field, except as to the Oklahoma City Field where another umpire was named to control proration.

In the operation of the proration method, it was charged that discrimination in favor of the Seminole Field and against the Oklahoma City Field has been practiced. "The Seminole operators, paying the freight on this system, have been permitted to produce 50 per cent of the potential capacity of wells in that field while the operators in the Oklahoma City Field, in which we have nine wells, are allowed a production of only 1 per cent.

Allowable Production

"The Oklahoma City Field, in January, 1931, had 67.5 per cent of the total potential production of the State, but was allowed to produce only 16.8 per cent of

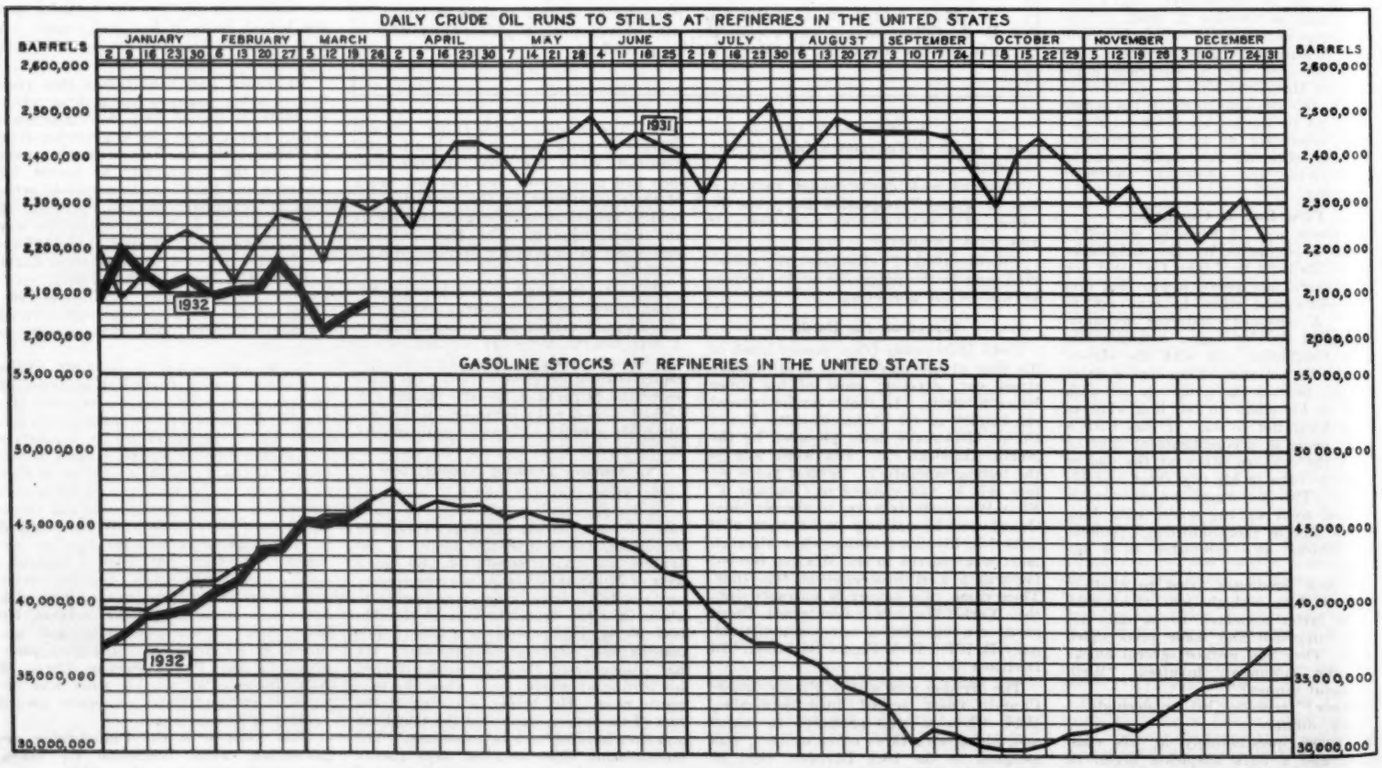
(Continued on Page 143)

AMERICAN PETROLEUM INSTITUTE WEEKLY REFINERY STATISTICS

The weekly report made to the American Petroleum Institute on refinery statistics—crude runs to still, gasoline stocks and gas and fuel oil stocks in barrels—for the week ending March 26:

	Week ending March 26				Week ending March 19				Week ending March 21, 1931			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
East Coast	100.0	445,400	6,680,000	5,705,000	100.0	423,300	6,833,000	5,944,000	100.0	459,400	8,689,000	7,189,000
Appalachian	91.8	92,000	1,859,000	1,148,000	91.8	91,500	1,865,000	1,148,000	93.8	94,000	1,662,000	1,163,000
Indiana, Illinois, Kentucky	98.9	303,700	6,369,000	3,980,000	98.9	252,000	6,080,000	4,103,000	97.5	303,200	5,616,000	3,066,000
Oklahoma, Kansas, Missouri	89.6	233,300	4,033,000	2,970,000	89.6	230,300	3,885,000	2,986,000	89.4	250,100	3,473,000	3,547,000
Texas	91.3	452,900	9,194,000	9,011,000	91.3	444,700	9,137,000	9,420,000	91.9	536,300	7,767,000	8,178,000
Louisiana and Arkansas	98.9	145,900	1,833,000	4,278,000	98.9	150,300	1,798,000	4,036,000	98.3	145,000	1,913,000	2,372,000
Rocky Mountain	89.4	33,700	2,049,000	638,000	89.4	32,600	1,986,000	657,000	93.1	48,000	1,874,000	838,000
California	97.1	469,100	14,709,000	96,443,000	97.1	460,300	14,794,000	95,826,000	98.8	461,000	15,764,000	101,347,000
Total United States	95.2	2,176,000	46,726,000	124,173,000	95.2	2,085,000	46,428,000	124,120,000	95.7	2,297,000	46,758,000	127,691,000
Texas Gulf Coast	99.8	360,600	7,504,000	6,355,000	99.8	355,600	7,469,000	6,754,000	100.0	400,000	6,580,000	5,923,000
Louisiana Gulf Coast	100.0	106,400	1,697,000	3,624,000	100.0	105,300	1,660,000	3,376,000	100.0	97,000	1,719,000	1,330,000

(1) Per cent refinery capacity represented. (2) Daily crude runs to stills. (3) Gasoline stocks. (4) gas and fuel oil stocks.



All data based on weekly reports of the American Petroleum Institute. Figures for last week not shown in graph but are included in above table.

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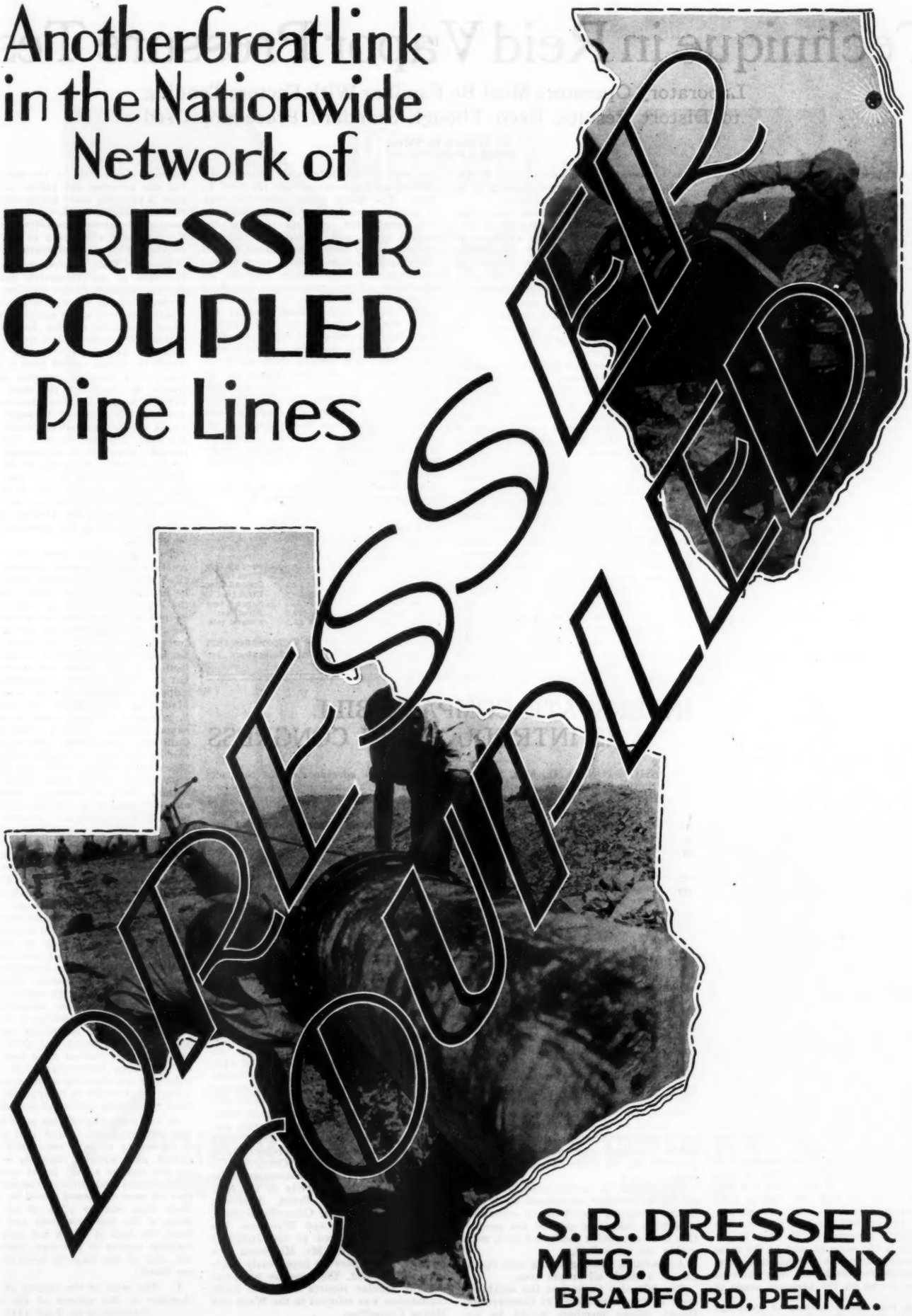

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Technique in Reid Vapor Pressure Tests

Laboratory Operators Must Be Familiar With Factors Tending to Distort Results, Even Though Standard Procedure Used

By Warren L. Felton
Phillips Petroleum Co.*

Vapor pressure is, undoubtedly, the most important single factor in the manufacturing, blending and shipping of natural gasoline. To the plant chemist who is responsible for keeping his net production up, and at the same time, for not exceeding the specified vapor pressure of the particular product to be shipped, the Reid vapor pressure becomes his sole guide. It behooves him, then, to know something about the method as to the reasons for changing from the old Bureau of Explosives method to the new volatility specifications which have been adopted by the Natural Gasoline Association of America, and which were optional during 1931, but are now the official specifications. The man in charge of the manufacturing and shipping of only one product, or perhaps 8 or 10 products, should know something of the advantages of the Reid vapor pressure method over the old method; the accuracy of results and the ability to check results; the extreme care and rigorous attention to details required in running the tests; the interpretation of the A.S.T.M. Reid Method D-323—31T, particularly in the procedure; the selection and care of pressure gauges and bombs; the use of the two types of bombs and the ability to check the results with the California type against the standard type.

In practically all instances, natural gasoline is used either for blending with refinery product to make a motor fuel, or, in the case of the lower vapor pressure products, it is used as a 100 per cent natural as a premium motor fuel or aviation gasoline. In both cases its vapor locking tendencies are judged by use of the Reid vapor pressure. The value of the use of natural gasoline in motor fuel to increase the effective volatility is now an accepted fact, but this effective volatility cannot be maintained within the desired limits, if the vapor pressure of the natural gasoline is not as specified by the blender. The Reid vapor pressure, thus, tells us how much natural gasoline may be used and the two A.S.T.M. distillation points, which are the percentages evaporated at 140° and 275° F., tell us the influence of the natural gasoline upon the effective volatility of the finished blend. Due to this trend to volatility specifications the Natural Gasoline Association of America has adopted and issued the new specifications.

It might be well to stress at this point that the Reid vapor pressure is read in pounds per square inch, absolute, at 100° F., but for the purpose of brevity, it is recorded in pounds without referring to the temperature of the bath into which the bomb is immersed or to the unit of surface. In the old Bureau of Explosives method, the vapor pressure was read in pounds per square inch, gauge, but in reality, it was neither gauge nor absolute pressure due to the variableness in the amount of air in the bomb after the bomb was vented at 70° F. In a test which was being run on a sample of high volatility, all of the air and some of the vapors was lost (hence, a too low vapor pressure of the more volatile products), while in venting the bomb containing a more stable sample, a large percentage of the air remained and very little, if any, of the vapors lost. It was, thus, not possible to honestly call the results anything except "pounds I.C.C. vapor tension." In the Reid method, however, the atmospheric pressure of the air in the air bomb is the same as, and at the same time, counteracts the atmospheric pressure outside the bomb; the only internal pressure acting on the pressure gauge is that generated from the liquid in the bomb so that the gauge reading is in pounds per square inch, absolute.

The advantages of the Reid vapor pressure method over the old Bureau of Explosives Method are readily apparent to anyone who has used both procedures. There are five chief sources of error in vapor pressure determinations of gasolines which may be stated as follows:

1. Evaporation of the sample.
2. Dissolved air in the sample.
3. Air present in the apparatus.
4. The spring gauge error.
5. Personal errors.

The old Bureau of Explosives method presented all of these errors, some of which were of extremely wide variance due to the process of venting at 70° F. The vapor pressures determined by this method were thus erratic with a tendency to be high when they should have been low, or vice versa.

There is some chance of evaporation and spilling in the Reid method if samples are not drawn and handled very carefully. The experienced operator can overcome this difficulty. This method greatly minimizes the effect of air in vapor pressure determinations because the "initial air temperature," which is the temperature of the air and water vapor in the air chamber, has a correction factor (found in the procedure—A.S.T.M. Method D-323—31T), which makes it possible to calculate the "Reid vapor pressure" from the "uncorrected vapor pressure" by allowing for the change in the pressure of the water vapor and air in the air chamber due to the differences between the "initial air temperature" and the 100° F. bath. The spring gauge error can only be compensated for by the selection of a well constructed, accurate gauge of the desired range, and, probably of primary importance, by very careful handling and checking for accuracy on a dead weight tester or mercury column. From the standpoint of personal errors the Reid method presents the least manipulative difficulties of any method, and at the same time yields results only slightly lower than the calculated vapor pressures. It may be said that the personal error enters into this method particularly in two instances: (1) The reading of the thermometer to secure "initial air temperature" of air bomb, and (2) the thorough purging of the air chamber with warm water to remove any gasoline vapors that may remain from a previous test. By carefully and rigorously following the procedure most of these difficulties will be eliminated.

The Reid method is capable of checking itself closely as shown in Table 1.

Sample—	Reid V.P., lbs.	
Pursuit aviation	6.8	First test
Pursuit aviation	6.6	Second test
Grade 14-55	11.0	First test
Grade 14-55	10.8	Second test
Pentanes	19.5	First test
Pentanes	19.2	Second test
Grade 26-70	25.4	First test
Grade 26-70	25.1	Second test
Grade 30-70	29.5	First test
Grade 30-70	29.8	Second test

It has been the writer's experience that in most cases, where two operators are running check tests on the same sample, the one securing the higher vapor pressure is probably more nearly correct than the one securing the lower result, because most of the errors committed in running the test have a tendency to cause an ultimate lower vapor pressure result.

The A.S.T.M. requirement that limits the ratio of the volumetric capacity of the air chamber to the gasoline chamber between 3.8 and 4.2 was determined after a series of tests using samples of various vapor pressures ranging from the most volatile to extremely low vapor pressure products, and vapor pressure bombs in which the ratios varied from 0 to 8. It was found that all samples gave consistent results when the ratio was between 3.8 and 4.2, but that any other ratios, while applying to some samples, would not give consistent results from all samples. This means, then, that the air chamber should have a capacity of from 3.8 to 4.2 times as much as the gasoline chamber, preferably 4. In case there is any doubt as to this ratio of the bombs in the plant laboratory, or in a referee test, the method for finding the exact ratio, as stated in the procedure, should be utilized.

To those plants that have efficient fractionating equipment whereby the desired control of the vapor pressure may be maintained on the kettle product, or the overhead product, or both, the Reid method will be of most value and will offer the best opportunities for its use in fractionator control. To plants that do not have the more efficient equipment, the method is still useful for control work, but it is of primary importance as a shipping limitation. In the case of manufacturing Grade 26-70, for example, it is necessary in most cases to check the vapor pressure in stock tanks with the California type bomb. The vapor pressure in the tank car, using the standard type bomb, should check the California type within the 0.5 pound allowable tolerance. This, of course, is disregarding any evaporation in loading which would produce a lower vapor pressure in the tank car. If a 26-pound Reid vapor pressure is the maximum allowable, the wise operator will make a product having a vapor pressure of 25.5 to 26.0 pounds Reid, preferably 25.8 pounds. Exceeding the allowed vapor pressure under the new system would present the same situation as shipping 88 to 89 per cent recovery for 90 per cent under the old system. This example is cited simply to stress the thought that the utmost care and rigid following of the correct interpretation of the procedure is necessary. Every man who runs Reid vapor pressures must become "vapor pressure conscious" and realize that he is handling a high-class, expensive piece of laboratory equipment. The writer has found that most discrepancies in this method have been caused by the wrong interpretation of the procedure or the slighting of some seemingly trivial point which in reality affected the final result from 0.5 to 3.0 pounds.

At the beginning of this year the Phillips Petroleum Co. found that it would be necessary to take the A.S.T.M. procedure, and, without changing or affecting the method at all, insert specific interpretations and definite instructions so that all men concerned would be running these tests exactly alike at all plants. Some of the interpretations and instructions, the lack of which not only caused variable results in our own laboratories, but also at the buyer's receiving point, are listed:

1. The ratio of the volume of the air chamber to the volume of the gasoline

(Continued on Page 141)

*Paper read before meeting of plant operators at Ranger, Tex., March 29.

INTERSTATE COMPACT BILL IS INTRODUCED IN CONGRESS

WASHINGTON, D. C., Mar. 28.—A bill authorizing an interstate compact to control production and refining of crude petroleum as proposed by the Oil States Advisory Committee has been introduced in the House of Representatives by Congressman Tom McKeown of Oklahoma.

The measure, together with one requiring the tariff commission to report semiannually upon imports and exports of oil, were drafted by the advisory committee.

The bill would grant permission to two or more oil-producing states to agree upon "uniform principles and enact laws for the conservation of oil and gas and the prevention of premature exhaustion of American sources of supply."

The purpose of the compact includes: Requirement of the most effective and economic use of reservoir energy; equitable apportionment of the contents of a common source of oil or gas; regulation and control of drilling, producing, refining, distribution and operation methods, so as to promote maximum ultimate economic recovery and use; retention of underground oil and gas whose production would be in excess of transportation or marketing facilities, or reasonable market demand, and, when required, to preserve the oil pools of settled production.

Prohibition of unreasonable waste of all kinds, whether occasioned by breach of the foregoing objectives or otherwise.

Ratable taking of oil and gas production from competing fields and from wells within the same field.

Authorizing and regulating unit operation of a single oil or gas area.

The bill also authorizes the establishment of an "Interstate Oil Conservation Board, whose members would be approved by the governors of the compacting states. This board would co-operate with the Federal Oil Conservation Board and be authorized to recommend regulations for economic production and distribution of oil and gas; study and forecast demand for American products; recommend allocations of such demand among producing areas; recommend state production quotas; approve agreement entered into by compacting states; study and make recommendations upon foreign imports, and of such further legislation as may be found necessary."

Specific provision is made for legalization of oil and gas conservation laws in the states, which shall not be deemed an unwarranted interference with commerce with foreign countries and among the states.

Administration provisions are carried in the bill, together with the condition that unless a compact within the authority of the measure is agreed to within three years after the measure is enacted, the authorization shall automatically cease. The second section, which will give the joint committee adequate information upon oil imports and foreign production, would require the tariff commission to make a complete report to the committee each April and October.

States which the bill contemplates including under the authority of the compact are Oklahoma, Texas, Arkansas, California, Louisiana, Colorado, Kansas, New Mexico, Ohio and Wyoming. The compact was referred to the Judiciary Committee of which Mr. McKeown is a member, and where he hopes early hearings will be had. The measure authorizing the regular reports from the tariff commission was referred to the Ways and Means Committee.

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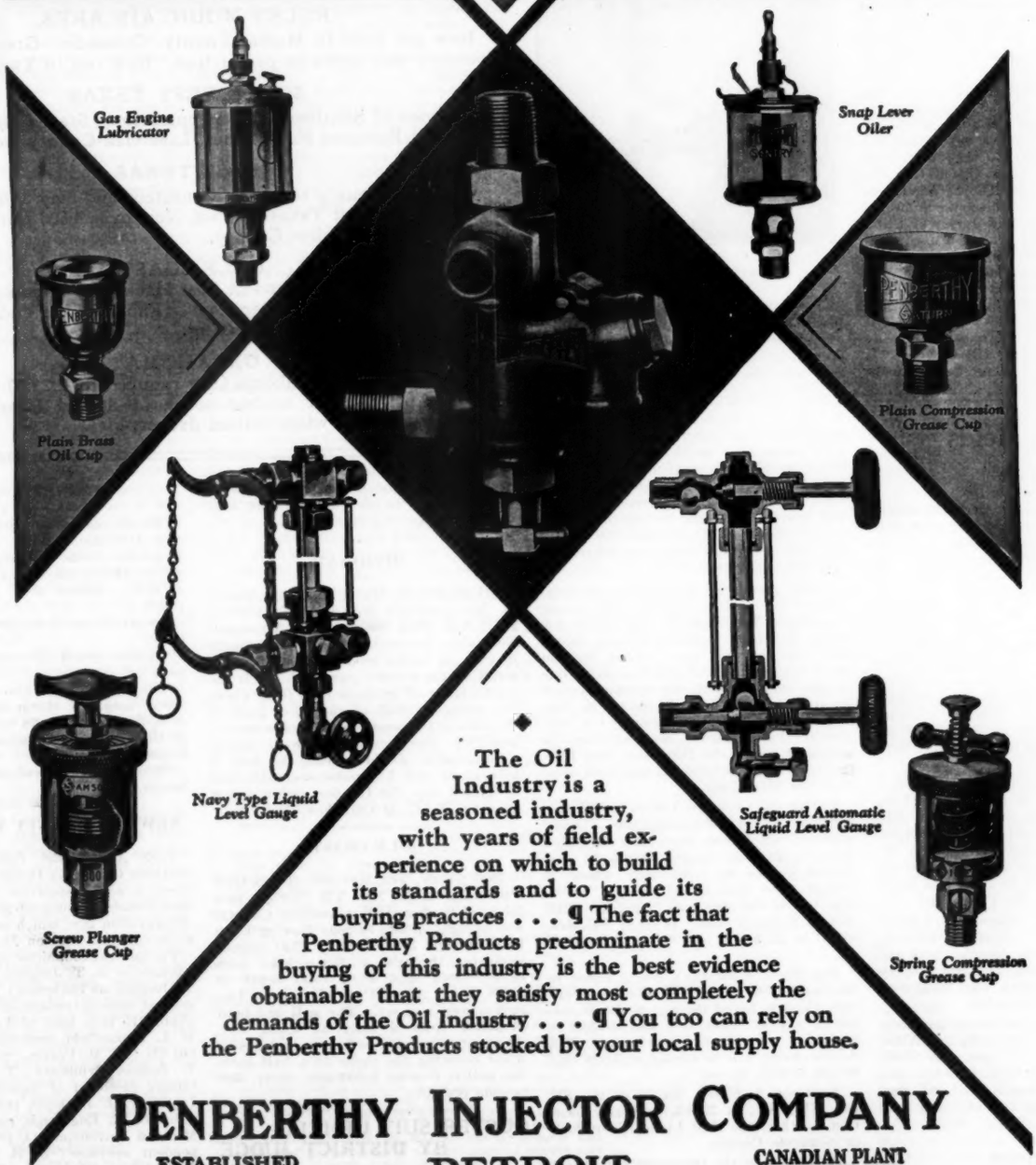
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R. M. YOUNG, HEAD OF CARTER, RESIGNS TO TAKE NEEDED REST

R. M. Young, president of the Carter Oil Co., and for the past 39 years connected with companies affiliated with the Standard Oil Co. (New Jersey), has resigned, effective March 31, in order that he may take a much needed rest. He will continue to make his home in Tulsa.

Mr. Young will be succeeded by C. H. Lieb, who, until the present time, has been vice president of the Creole Petroleum Corp. and president of the Standard Oil Co. of Venezuela. Mr. Lieb will come to Tulsa to make his headquarters.

Dick Young, as he is known to oil men throughout the world, was born at Ironton, Ohio, in 1876. His family moved to Pittsburgh when he was 6 years old. He entered the oil business in 1893 as office boy for the Forest Oil Co. He was placed in the accounting department of the company and his work in auditing and accounting won him promotion to executive work.

After spending seven years with the Forest Oil Co., Mr. Young went to Neodesha, Kans., at the time of the organization of the Prairie Oil & Gas Co. From 1903 to 1905 he was associated with the New Domain Oil & Gas Co. at Lexington, Ky. In 1906 he was transferred to the auditing department of the Standard Oil Co. of New Jersey at Pittsburgh, Pa., where he remained until coming to Tulsa 15 years ago. He succeeded J. Edgar Pew as vice president and general manager of the Carter in 1918 and retained that position until 1926, when the Board of Directors of the Standard Oil Co. (New Jersey) selected him as president of the Carter Oil Co.

The many and important developments affecting the petroleum industry in the Mid-Continent area during recent years added greatly to Mr. Young's work as his advice was sought both by the large

R. M. Young

and small companies. So many matters needed his attention he kept postponing a much-needed vacation until he finally decided to resign and enjoy a well-earned rest unhampered by oil industry problems.

High Spots in Field News

WEST AND NORTH TEXAS

Increase in locations in West Texas; 9 added in Ranger district also. Coke County test most interesting at present.

KANSAS

Extensions in Voshell and Wright Pools and semiwildcat completions feature otherwise dull week in Kansas areas.

CALIFORNIA

Lid being clamped tighter on California production. Gas conservation law developments main topic on Pacific coast.

NORTH LOUISIANA, ARKANSAS, MISSISSIPPI

Renewed activity in North Louisiana. Two completions in Zwolle and two more gas wells in Jackson Field, Mississippi.

ROCKY MOUNTAIN AREA

New gas field in Moffat County, Colorado. Greasewood Dome discovery well again on production. New test in Yuma County.

SOUTHWEST TEXAS

Increase in Southwest Texas operations, Starr County, Northern Duval and Balcones Fault zone. Live Oak County well tests oil.

EAST TEXAS

Cherokee County test with saturated sand may add fifth producing county to East Texas district. Now over 4,600 completions. Disappointment in Upshur County.

GULF COAST

Flank production found at East Hackberry opening new horizon and second extension in ten days. Rabbs Ridge and Montgomery County deals create better feeling.

OKLAHOMA

Nominations at Oklahoma City reduced to 102,600 bbls. for first half of April. Carter wildcat south of Sacred Heart district increases production when drilled deeper.

Late Fields

KANSAS

Seven new oil tests were announced for Kansas during the week in five counties. Two of the new operations were located in Greenwood County, two in Cowley County and one each in Ellsworth, Harvey and Sedgwick Counties.

The area around the Frank Hollow's No. 1 Church area, in Section 20-22-3w, Harvey County, is becoming active, several new locations were staked around the well. The well is producing from the Hunton lime. Six new operations were under way around the Shell Petroleum Corp.'s No. 1 Blake, in Section 23-23-4w, the discovery in northeastern Reno County.

Washabaugh and others are to drill a Siliceous lime test in Section 15-24-5w, Reno County. It is expected the lime will be found at approximately 4,000 feet. It will be located southeast of W. C. McBride,Inc.'s test in Section 36-23-5w, which was drilled in 1929, and found a showing of oil in the Viola lime.

Derby Oil Co. and others' No. 1 Rainbow, NW cor. SE, Section 33-22-7w, Reno County, is a new location with the rotary rig moving out. The test will be drilled in an area that has been core drilled, and found favorable.

In an attempt to develop a gas supply in the townsite of Wichita the Wible Ice Co.'s No. 1, in NW cor. SW NW, Section 27-27-1, Sedgwick County, was drilled to a total depth of 1,587 feet where it found a hole full of water and was abandoned.

OKLAHOMA

At the meeting held Monday, March 28, before the Corporation Commission, 20 purchasing companies nominated 102,680 bbls. a day for the first half of April. The Sinclair-Texas Pipe Line Co. did not make any nomination. It has been handling approximately 11,300 bbls. a day, during the present period.

The hearing was cut short and recessed until Wednesday, March 30, when a statewide proration hearing will be held. At that time the commission will hear further nominations for the Oklahoma City Field and consider the recommendations and objections to the reclassification of wells in the field by the committee of five and that certain underproduction in the field be wiped out.

A few companies' nominations were increased for the first half of April among them being the Oklahoma Pipe Line Co. which has been handling around 18,000 bbls. for the last two months and on April 1 will handle 25,000 bbls. daily, due to the completion of its booster station on its pipe line near Wellston, in Lincoln County. Globe Refinery Co. and Century Petroleum Co. each increased its nominations and the Petroleum Pipe Line Co. reduced its purchases from 2,000 bbls. to 1,500 bbls. daily.

Carter Oil Co.'s No. 1 Monett, SW cor., Section 35-7-4, Pottawatomie County wildcat, which has been shut in since January 28, was opened March 28, and drilled deeper to 4,262 feet, where it flowed 1,068 bbls. of oil in 18½ hours. The top of the pay was found at 4,210 feet in Simpson sand. It made 867 bbls. of oil in 22 hours just before being shut in.

The Texas Company's No. 2 Eliza, in Section 19-7-8, in the Fish Pool, in Seminole County, found the top of the Wapanucka pay at 3,018 feet and drilled to 3,027 feet where it was showing gas. The 8-inch casing will be landed at 3,026 feet before drilling deeper.

Anderson & Kerr's No. 1 in the SE cor. NW, Section 29-8-7, is a new location, north of the East Little River Pool, in Seminole County.

Production of the Oklahoma City Field showed a sharp decline over the week-end. On March 27 the production was 96,670 bbls. from 161 wells, on March 28, at 7 a.m., it was 53,544 bbls. from 118 wells. Phillips Petroleum Co.'s No. 1 Beighler, NW cor. SE NE, Section 22-11-3w, on the southwest edge of the field, made 272 bbls. of oil in three hours from the Wilcox sand at 6,464-79 feet. The gas was estimated at 45,000,000 feet a day. This is one of the smallest wells yet completed in the Wilcox sand zone in the Oklahoma City Field.

MICHIGAN

MUSKEGON, Mich., Mar. 29.—Walter L. McClanahan's No. 4 A. G. Struble, SW NE SW, Section 10, Greendale Township, Midland County, was brought in with an initial production of 750 bbls. a day in the Dundee pay sands. It is the fourth large oil producer on a lease where the discovery well of the East Pool of the Mount Pleasant area was brought in last July. Two semiwildcat wells which, if successful, would extend the pool a mile north and 1½ miles east also will be drilled into the Dundee within a few days by W. L. McClanahan, Inc.

GULF COAST

HOUSTON, Tex.,Mar. 29.—Texas Gulf Producing Co.'s No. 6-H Kirby, east flank of Barbers Hill, Chambers County, was brought in late Sunday flowing 1,700 bbls. of pipe line oil daily, 200 pounds pressure, through a five-eighths inch choke, from sand at a total depth of 5,288 feet. A total of 65 feet of 5⅞-inch screen was set. The well had been deepened from a sand at 5,108 feet, where it formerly had been completed. After reducing the choke to a half inch, the well is flowing 1,350 bbls. daily, 300 pounds pressure.

OUSTER SUIT UPHELD BY DISTRICT JUDGE

AUSTIN, Tex., Mar. 28.—District Judge J. D. Moore upheld the validity of the Texas antitrust laws in a ruling Monday on Atty. Gen. James V. Allred's penalty and ouster suit against oil companies over the petroleum industry code of ethics. Company demurrers attacking the law were overruled. During the week a date will be set for beginning actual testimony in the trial.

MAGNETIC STORM

Tucson observatory of the U. S. Coast and Geodetic Survey report moderate magnetic storm starting at 9 a.m. (C. S.T.), March 20, and ending at 8 a.m. (C.S.T.), March 23. Their telegrams follow:

"Storm began Twentieth. Fifteen. Moderate."

"Storm ended Twenty third. Fourteen."

The observatory also reports that a severe magnetic storm started at 8 a.m. (C.S.T.) on March 28 and still continues at time of going to press. The telegram follows:

"Storm began Twenty-eighth. Fourteen. Severe."

NEW CALIFORNIA ASSOCIATION

LOS ANGELES, Calif., Mar. 26.—Southern California Independent Oil Operators, a new association of oil men, has been formed by supporters of the Sharkey conservation law, which will be submitted to referendum vote on May 3.

The general committee of the new group consists of A. T. Jergins, president of A. T. Jergins, as chairman; Fred Anderson, general superintendent of Ohio Oil; Alphonzo E. Bell, head of A. E. Bell Corp.; R. L. Broomfield, president of Barnsdall Oil Co.; C. M. Cotton, vice president A. T. Jergins Syndicate; T. A. O'Donnell, former president of American Petroleum Institute; J. J. Doyle, independent operator; C. R. Edgecomb, vice president of Midland Petroleum; O. D. Knight, independent operator; S. B. Mosher, president of Signal Oil; Glen Ruby, president of Nordon Oil Corp.; Edgar L. Tompkins, vice president of Maricopa Star Oil Co., and Roy Young, president of Young Petroleum.

COLON PRODUCTION

Production of Colon Oil Corp.'s subsidiary in Venezuela for the week ended March 19, was 109,426 bbls.

East Texas Area May Add New County

Cherokee County Test Finds Well Saturated Sand and May Mean Mile Extension Southwest of Joiner Pool. Over 4,600 Completions Now

By L. E. Bredberg

DALLAS, Tex., Mar. 28.—Cherokee County appears as almost sure to be added to the other four producing counties in East Texas; Gregg, Upshur, Smith and Rusk Counties, extending the producing area another mile farther southwest of the Joiner Field which lies in the southwestern part of Rusk County, and southeastern part of Smith County.

Merry Brothers and Perini's No. 1 Kelly in the M. De Los Santos Coy Survey, northeastern corner of Cherokee County, has cored 2 feet of well saturated oil sand, from 3,677-79 feet, which is sufficient to make a producing well in this field, therefore sure of bringing production to this fifth county in the district. Surface elevation of the well is 371 feet, which makes subsea datum on top of sand minus 3,306 feet, or above the known water level in the field. Casing is now being run and cemented, and it will be several days before the plug is drilled, and the outcome of the well definitely known.

Clopton and others' No. 1 Pace in the northeast corner of a 40-acre tract in the Wesley Dykes Survey, is the second most interesting test in this corner of Cherokee County, as it also has chances of extending production, and is being closely watched. It is a little over 2 miles south of the above mentioned test, and approximately 9,000 feet west of The Texas Company's No. 1 Henry, the nearest producer over in Rusk County, consequently several hundred more acres will be added to the field if it proves another extension well. It is drilling at 3,515 feet in Austin chalk, top of the chalk not known. Top of the Austin was logged at 3,525 feet.

The Mid-Kansas Oil & Gas Co. has staked an east offset location to the Merry Brothers and Perini test. It is on the M. M. Cross farm in the Fowlks Survey. Patton, Liver and Murray are also moving in a rig on the Eddie Toole farm, in the De Los Santos Survey, 6 miles east of Troup in the same county, Cherokee.

Sinclair Gas Well

Sinclair Oil & Gas Co. has completed its first gasser in the field, and the third dry gasser for the district. It is a north offset to the first dry gas well of the field, Peyton Brothers' No. 1 Berry. The Sinclair gasser is on the Ashby farm in the William Clark Survey, southern Rusk County. Total depth is 3,681 feet, and top of gas sand was logged at 3,662 feet. It gauged 17,000,000 feet of dry gas through 2½-inch open tubing, with 1,300 pounds rock pressure on the casing.

The Columbia Oil & Gas Co. abandoned an east side test this week in the D. Sanches Survey, on the Castleberry lands, Gregg County. Total depth is 3,684 feet. B. F. Findley abandoned a western Gregg test on the C. C. Crews farm in the L. Perkins Survey, limiting production on the western edge of the field.

Upshur Disappointment

Wadley's No. 1 Oliver in the S. Sanders Survey, an interesting test in Upshur County, failed to show anything on drill stem test at 3,785 feet, cored white sand from 3,785-89 feet and sandy shale from 3,789-95 feet, drilling a tight dry sand at 3,820 feet, testing dry on a second drill stem test, and proving a disappointment. It is 3 miles north of the Cranfill & Reynolds' outpost producer of southern Upshur County. It ran around 20 feet lower than the latter mentioned well which had top of sand at minus 3,377 feet.

Many were of the opinion that the Cranfill & Reynolds producer was an extreme north edge well, and figured the Wadley test a dry hole, which is quite apparent at this writing. The McFarland test, approximately 1 mile east of the outpost producer, on the Willie Starr farm in the C. H. Cooper Survey, is shut down at 3,250 feet. It will be drilled deeper, and is considered as having excellent chances for making some kind of a producer.

A. A. Trammell and others' No. 1 Hampton have a rig on an interesting northwest edge location in Upshur County. It is in the southeast corner of the south 60 acres of the east 150 acres of the Hampton 192-acre tract in the William King Survey, and approximately three-quarters of a mile southwest of a dry hole.

Over 4,600 Completions

There are now over 4,600 completed wells in the East Texas district. With completions reported at an average of 80 per week in the field there should be approximately 5,300 completed wells by the first of July. There were 123 locations reported for the district this week, and completions may average more than 80 per week during the next eight weeks. Overton, Kilgore and Gladewater are the scenes of rapid town lot drilling, everything, even homes and store buildings giving way to derricks. Northern Gregg, southern Gregg and southern Rusk Counties continue to remain the most active areas. This is due to the greater width, and consequent greater number of leases in these parts of the field, and also because pressures are higher in these areas, necessitating no pumping equipment at this time to raise the oil.

There are now 86 wells pumping in the Joiner area, on the eastern edge of the field, Rusk County, while six are standing dead. Thirteen are on the pump in the Kilgore area, and four are standing dead. Only three are pumping in the Lathrop area of Gregg County, while none are dead. Equalization of pressures throughout the field has resulted in many of the former pumping and dead wells flowing, higher pressure areas of the field acting as repressuring bases for the lower pressure areas. This will eventually lead to the dissipation of the pressures to such an extent throughout the field that pumping equipment will be needed in the higher pressure areas much sooner than otherwise would have happened, and will be required almost simultaneously within the lower pressure areas. Several of the larger companies have had and have at present engineers making an extensive study of pressure conditions of the field, collecting all of the data possible on this phase of production, and its problems as connected with pressures.

For the week ending March 23 an average of 12,320 bbls. per day was withdrawn from East Texas storage. Distribution was 339,059 bbls. while production averaged only 327,738 bbls. per day, production decreasing 1,596 bbls. from the previous week, while distribution increased around 21,100 bbls. per day. The new 72-bbl. per day well allowable was responsible for the decrease in production.

Several of the purchasing companies in the field continue to take outside connections, while only two or three which have been overloaded have disposed of undesired connections, and are not turning loose any more.

The Southern Oil & Refining Co. has erected two 10,000-bbl. tanks at its refinery at Reeds Switch, southwest of Kilgore. The plant has 2,500 bbls. daily capacity, and may be increased to 3,000 bbls. or more per day.

Demand for New Material

There is but little second-hand material and equipment going into the East Texas Field now, and much more new equipment is in demand than during the past month. Very few trucks can be seen on the roads bringing in second-hand pipe and equipment, whereas last summer hundreds of trucks were wending their way to the largest field in the world. Twenty-nine loads of casing in one night, trucked to meet immediate demand, is a sign that new pipe and equipment is more in demand than previously. Many new steel rigs standing in the field are also proof that the supply houses are now "getting more of a break" than heretofore when wood derricks were erected.

Second-hand tank material is giving tank companies less competition than it has for several months. Smaller separators are moving to the wells before they are ready to be completed. One of these companies is concentrating on a water knock-out, while another has a heater which is being used in conjunction with its tanks, to separate water from the oil.

Drilling costs have reached a minimum, one of the companies paying $1.65 per foot while another pays only 2 cents more. This is believed to be the limit in getting the wells drilled at low figures. Cost of a well drilled for these prices runs the owner only $12,500.

Acreage continues to change hands, the major companies farming out considerable edge acreage to smaller operators, this acreage to be paid for out of oil produced from it.

Spurt in Upshur

Eslick's No. 1 Whitehurst, extension producer of the Lathrop area, southeastern Upshur County, which was completed last week, gauging 190 bbls. in one hour at a total depth of 3,628 feet, is now the scene of an extensive drilling spurt, many locations having been staked immediately after the well was brought in, and several rigs erected and drilling started. Most of this work will be in the McKinney and Williams Survey, around the new well. The James McRea Survey will be another active area in the vicinity of the well. Several new tests are to be started soon in counties adjacent to the producing counties of Upshur, Rusk, Gregg, Smith and Cherokee, and companies and individuals are taking blocks.

Sabine County

One of the most active areas at present is on a big nosing which extends from east to west, south of Patroon in Shelby County to north of Geneva, in the extreme northwestern part of Sabine County. The Baker test is on the west; Spitznagel is drilling a test to the east of this test and east of the Sabine County line; The Texas Company and Magnolia Petroleum Co. are drilling in the center of Sabine County, east of the former mentioned test, and Franklin Smith is drilling across the line in Shelby County. The Baker test is over the line in San Augustine County. The Zwolle Field of Louisiana lies across the Louisiana line from this active area.

The Pure Oil Co. is taking a large block of acreage near Mount Enterprise in the extreme southeastern part of Rusk County. A big nosing with a major fault running from east to west from Concord to Sulphur Springs is responsible for this block being taken.

The Shell Petroleum Corp., Humble Oil & Refining Co., Amerada Petroleum Corp., The Texas Company, Sun Oil Co., and Stanolind Oil & Gas Co. all have holdings which center around the Z.

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EAST AND EAST CENTRAL TEXAS WILDCATS

Week Ending March 28

ANDERSON COUNTY

Company, well, farm name, section and block— Remarks:

C. R. Wilmuth et al's No. 1 N. B. Watson, 500 ft. from W line and 4,850 ft. from N of S line of survey in S½ of 129-ac. tract, M. Main Sur. .....T. D. 1,538 ft.

ANGELINA COUNTY

Helburt et al's No. 1 Long Bell Lumber Co., 160 ft. from S line and 200 ft. from E line of Sec. 9, H.&T.B. Sur. .....Location.

BOWIE COUNTY

Burnham-Robertson and Greer's No. 1 F. O. Weiss, 850 ft. from N line and 200 ft. from W line of B. H. Williams 50-ac. tract, Jessie Dean Sur. .....Rig up.

CHEROKEE COUNTY

Bridges and Candler's No. 1 Berryman, center of Berryman tract, H. Kimble Sur. .....S.D. 1,000 ft.

V. Clopton & Hawkins' No. 1 A. P. Pace, 288 ft. from N line and 330 ft. from most northerly E line of 40-ac. lease, W. Dikes Sur. .....Drlg. 3,510 ft.

Harper and Perkinson's No. 1 J. T. Lowery, 650 ft. from N line, 150 ft. from W line of Blk. No. 5 on a 139.6-ac. tract, 4 miles W of Troupe, C. B. Jennings Sur. .....Drlg. 2,300 ft.

Merry Bros. and Perini's No. 1 Annie Kelley, 330 ft. from N line and 443 ft. from E line of 393-ac. tract and 90-ac. lease, M. De Los Santos Coy Sur. ..T.D. 3,679 ft.; set csg.

Wilson & Stubbs' No. 1 L. Robert, 450 ft. from S and 150 ft. from W line of lease, J. B. Wolfin Sur.....S.D. 2,035 ft.

DALLAS COUNTY

Long Creek Dev. Co.'s No. 1 T. J. Lupton, center of 160-ac. tract, 3½ miles N of Mesquite, J. Johnson Sur. .....Rig up.

Paris' No. 2 Wilkinson, 2,787 ft. from NW and 3,241 ft. from SW of John P. Anderson Sur. .....T.D. 1,230 ft.; S.D.

Joe Wilson's No. 1 fee, 600 ft. from N line and 600 ft. from W line of 1,500-ac. tr., Jno. Scroggs Sur....S.D. 1,150 ft.

DELTA COUNTY

Joiner et al's No. 1 W. H. Martin, 330 ft. from N line and midway between E and W lines of survey and lease on 2,749-ac. tract, D. Parker Sur. .....Location.

Joiner et al's No. 1 Blackwell, 300 ft. S and 150 ft. from E lines of 275-ac. tract, Dunnetelle Sur. .....Rig up.

Worthington et al's No. 1 Pejernett, 776 ft. from S and 150 ft. from W in E. Chick Sur., 1½ miles W of Horton .....S.D. 3,315 ft.

ELLIS COUNTY

Clark-Brooks' No. 1 C. W. Golliday, 300 ft. from S line and 300 ft. from E line of tract and survey, John Bones Sur. .....Temp. abnd.; T.D. 2,880 ft.

Community's No. 1 Reeves .....S.D. 300 ft.

E. M. Rogers' No. 1 John Lee Winn, 1,650 ft. from E and 150 ft. from S of Orland, Orlo Wheeler Sur. ....S.D. 1,425 ft.

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Locations Increasing in West Texas

Eleven Made During Week, Five Wildcats. Coke County Test Most Interesting. Nine Locations in Ranger District

By L. E. Bredberg
Fort Worth Bureau, The Oil and Gas Journal

FORT WORTH, Tex., Mar. 28.—The staking of 11 locations in West Texas during the week marks a record for that district for many months. Six were in various producing areas, and the other five are to be wildcat tests. One of the most interesting will probably be Mid-Kansas Oil & Gas Co.'s No. 1 Hearn in Section 271, Block 1-A, H.&T.C. Survey, Coke County, in the vicinity of a former test which the company drilled and which encountered a good heavy showing of oil and some gas. There is no production near this area, the nearest being over in Runnels County to the east.

Irion County

Plymouth Oil Co.'s No. 1 Suggs in Section 3,081, Block 28, H.&T.C. Survey, Irion County, is drilling around 7,100 feet filling 225 feet with oil in 14 days while standing shut down at 6,920 feet, making one of the best deep showings ever encountered in the county.

Stanolind Oil & Gas Co.'s No. 1 Williams is moving in new rotary equipment after failing to pull stuck drill stem which resulted from fire on the rig a couple of weeks ago. This is another deep test for Irion County, and was down 7,425 feet when the fire caused trouble.

Schleicher County

Schleicher County's interesting wildcat, Eastland Oil Co. and others' No. 1 Tisdale, in Section 29, Block M, G.H.& S.A. Survey, is drilling at 5,340 feet in hard lime, encountering a slight increase in gas at 5,325 feet, but still not enough to be of much consequence.

Winkler County

Richardson and others' No. 1 Halley in southern Winkler County, which formerly looked like a new pool opener for this part of the county, is now shut down at a total depth of 3,061 feet in hard white lime, to plug. It encountered salt water at 3,047-56 feet thereby ruining chances for making a producer. It formerly encountered a showing of oil and gas at 2,805 feet, an increase at 2,810, 2,860-76 and swabbed 12½ bbls. of oil per day at 2,957 feet with 500,000 feet of gas, but not enough oil to prove a commercial producer.

Andrews County

What may be a harbinger of ill luck showed up this week in Fuhrman Petroleum Co.'s No. 1 Boner in Section 24, Block A-43, Andrews County, when it topped the salt at 1,800 feet with a surface elevation of 3,196 feet, which throws the test around 90 feet lower than the salt top on the company's No. 1 Ford, a small producer three-quarters of a mile northwest in Section 16. Pay was topped in No. 1 Ford at 4,287 feet. Top of the anhydrite was logged at 1,774 feet.

Ward County

One of the O'Brien wells in northern Ward County encountered salt water this week at 2,800 feet. It was plugged back to 2,793 feet and flowed 50 bbls. of oil, and is now shut down to take bottom hole pressure. This well is owned by the Gulf Production Co., which holds leases on several hundred acres on the O'Brien and Edwards ranch, and on which it has many producing wells, keeping about two rigs running all the time, as is done in the McElroy Pool, Crane and Upton Counties, which is owned by the company.

Reagan County

Group No. 1 Oil Corp. and Continental Oil Co.'s No. 4-B, in the Big Lake Field, Reagan County, which was shut in two weeks ago, is rigging up boilers and preparing to run 5½-inch casing. The well is standing shut down at 8,587 feet, producing from 6,000 to 8,000 bbls. per day, untubed but pinched since May, 1931. No. 1-B University is bailing to test at 8,671 feet after killing production a week ago. It has been flowing an average of 300 bbls. per day against 70 pounds pressure. It was the first deep producer drilled in the field, and when trying to pull 5⅞-inch casing to deepen this casing stuck and had to be sidetracked, virtually a new hole having been drilled from 5,090 feet down to present total depth. It was averaging 2,270 bbls. per day before the well was shut in at its former total depth of 8,525 feet, and has never come back on production at such a high figure. Eight thousand and eight hundred feet of 3-inch tubing has been run in No. 3-B University, which is standing bottomed at 9,020 feet. On its first flow it gauged 1,097 bbls. in 17 hours. This is the deepest of the nine deep producers in the field.

PANHANDLE DISTRICT

The railroad commission rejected the Shamrock Oil & Gas Co.'s application designating Moore County as being a separate pool from the Gray and Hutchinson County fields. The county is now producing around 600 bbls. per day. A refinery owned by the company needs more production, and rejecting this petition will force it to be shut down, or operate on but a small amount of crude, but the drilling in of more producers in the area will alleviate its needs to a certain extent.

COMPLETIONS IN WEST TEXAS

Crane County

Gulf Production Co.'s No. 9 Rim and McElroy, top pay 2,795 feet, initial production 1,080 bbls., total depth 2,875 feet.

Loving County

Adams and others' No. 1 Wheat, top pay 4,396 feet, shot with 200 quarts from 4,360-4,403 feet, initial production 00 bbls. per day, total depth 4,403 feet. Columbia Oil & Gas Co.'s No. 1 Wheat, shot with 180 quarts from 4,442-4,396 feet, dry and abandoned, total depth 4,442 feet. Phillips Petroleum Corp.'s No. 3 Wheat, top pay 4,296 feet, shot with 132 quarts from 4,294-4,330 feet, initial production 191 bbls., total depth 4,331 feet. Stein-Bowers' No. 1 Wheat, abandoned location.

Wheat County

Wadsworth-Block's No. 1 Booger, shot with 100 quarts from 2,160-2,230 feet, dry and abandoned, total depth 2,300 feet.

COMPLETIONS IN PANHANDLE DISTRICT

Gray County

Skelly Oil Co.'s No. 25 Schaffer, top pay 3,100 feet, shot with 220 quarts from 3,110-3,245 feet, initial production 350 bbls. daily swabbing and flowing, total depth 3,250 feet.

RANGER AND WICHITA FALLS

There were nine locations in the Ranger district this week, two being in Coleman, one in Comanche, one in Eastland, one in Shackelford, and one in Palo Pinto. There were only a few in the Wichita Falls district compared with the number staked during previous weeks.

Cullum and Perkins, in the John Harris Subdivision, Block 157, a wildcat southwest of Archer City in Archer County, was the most interesting test of the week in the Wichita Falls district when it topped a pay formation at 1,190 feet and filled with oil and slopped over when drilled to 1,195 feet. It is 3 miles southeast of the nearest producer, which is on the Abercrombie ranch. It is estimated good for around 150 bbls. per day, opening up another producing area for

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WILDCAT OPERATIONS IN WEST TEXAS

Week Ending March 28

ANDREWS COUNTY

Company, well, farm name, section and block—	Remarks—
Fuhrman Pet. Co.'s No. 1 Boner, 1,320 ft. from N and 440 ft. from W, Sec. 24, Blk. A-43, P.S.L.	Drlg. 1,875 ft.; top salt 1,800 ft.

BREWSTER COUNTY

Brewster Oil Co.'s No. 1 fee, 2,640 ft. S and 2,598 ft. E of NW cor., Sec. 45, Blk. G-15, G.C.&S.F. Sur.	S.D. 1,935 ft.
E. L. Chapman's No. 1 Skinner, C SW SE Sec. 100, Blk. 2, G.C.&S.F. Sur.	S.D. 1,302 ft.
Trans-Pecos Oil & Gas Co.'s No. 1 Jones, 930 ft. from N and 2,500 ft. from E of Sec. 18, Blk. G-15, G.C.& S.F. Sur.	S.D. 2,900 ft.
Van McDaniel's No. 1 McIntyre, SE cor. Sec. 59, Blk. 352, 7 miles south Alpine	S.D. 1,750 ft.

COCHRAN COUNTY

Penn Oil Co.'s No. 1 Slaughter, C Labour No. 80 of League 129, Carson County School Lands	T.D. 5,052 ft.

CONCHO COUNTY

Beesley et al's No. 1 Waring Estate, 400 ft. from N and E, Sec. 163, T.&N.O. Sur.	T.D. 1,110 ft.

CROCKETT COUNTY

Coleman & Moore's No. 1 Ferner, 2,135 ft. from N and 1,485 ft. from E of Sec. 36, Blk. 2, I.&G.N. Sur.	Spudded and S.D.

CULBERSON COUNTY

Harris-Hann's No. 1 Seay, 1,980 ft. from N and E of Sec. 16, Blk. 54, P.S.L.	Location.

COKE COUNTY

Mid-Kansas Oil & Gas Co.'s No. 1 Hearn, 980 ft. from S and W, Sec. 271, Blk. 1-A, H.&T.C. Sur.	Moving in tools.

DAWSON COUNTY

Albaugh et al's No. 1 Robinson, C NW Sec. 46, Blk. M, E.L.&R.R. Sur.	To resume drilling.

ECTOR COUNTY

Thomas et al's No. 1 Edwards, 330 ft. from S, 2,310 ft. from E, Sec. 38, Blk. 43, Twp. 3s, T.&P. Sur.	Location.
Weekly Oil Corp. et al's No. 1 Cowden, 1,980 ft. from N and W, Sec. 33, Blk. 43, Twp. 2s, T.&P. Sur.	T.D. 4,430 ft.; to plug back for gas well.
H. F. Wurts' No. 1 E. A. Ibbetson et al, 330 ft. from N and E lines of NW Sec. 16, Blk. 46, Twp. 3s, G. M. M.Br.&A. Sur.	T.D. 3,270 ft.; to deepen.

EL PASO COUNTY

Tri-State Oil Co.'s No. 1 Bobadella, 1,325 ft. from S and E lines Sur. 254, S.F. No. 7,247	S.D. 2,257 ft.

FISHER COUNTY

Condor Petroleum Co.'s No. 1 Steele, 660 ft. from S and 330 ft. from W of W half of SE Sec. 210, B.B.B.&C. Ry. Sur.	Rigged up.
Cranfill & Reynolds' No. 1 George, 400 ft. from N and 380 ft. from E. Sec. 200, Blk. 1, B.B.B.&C. Sur.	Drlg. 5,195 ft.
Southern Oil Corp. of America's No. 1 Wm. Flannigan, 240 ft. from E and 165 ft. from W line of S 20 acres of SW, Sec. 20, B.B.B.&C.R.R. Sur.	Drlg. 2,850 ft.

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WILDCAT OPERATIONS IN TEXAS PANHANDLE

Week Ending March 28

BRISCOE COUNTY

Company, well, farm name, section and block—	Remarks:
Humble O. & R. Co.'s No. 1 C. Adair est., 2,500 ft. from N line, 2,100 ft. from E line, Sec. 7, Blk. G-6	Drlg. 2,030 ft.

CARSON COUNTY

Continental Oil Co.'s No. 4 Block, 330 ft. from N, 990 ft. from E, Sec. 111, Blk. 4, I.&G.N. Sur.	T.P. 3,020-30 ft; I.P. 115 bbls. first 24 hrs; T.D. 3,035 ft; C.O.
H. A. M. Oil Co.'s No. 2 Cooper, 330 ft. from S and E, Sec. 5, Blk. 9, I.&G.N. Sur.	Location.
Pulse-Shell Pet. Corp.'s No. 1 Byrum, 330 ft. from N and W, W½ NE, Sec. 188, Blk. 3, I.&G.N. Sur.	Rig.
Skelly Oil Co.'s No. 27 Schaffer, 1,265 ft. from S and 440 ft. from W, Sec. 88, Blk. 4, I.&G.N. Sur.	Drlg. 1,500 ft.
Texhoma Nat. Gas Co.'s No. 1-S Burnett, center SE, Sec. 94, Blk. 5, I.&G.N. Sur.	Drlg. 1,000 ft.

CHILDRESS COUNTY

C. L. Sloan et al's No. 1 B. P. Smith, Sec. 49, F. P. Knott lands	T.D. 5,000 ft.

COLLINGSWORTH COUNTY

Dixon et al's No. 1 Bell, 330 ft. N, 1,320 ft. W, Sec. 102, Blk. 21, H.&G.N. Sur.	S.D. 2,508 ft.
Downey et al's No. 1 Beasley, SE cor. SW SE, Sec. 95, Blk. 15, H.&G.N. Sur.	Rigging up.
Western Union Oil Co.'s No. 1 Farwell, C NW, Sec. 13-3n-2e	S.D. 375 ft.

GRAY COUNTY

Back & Barber's No. 1 Back, 660 ft. from S, 330 ft. from W, Sec. 140, Blk. 25, H.&G.N. Sur.	Drlg. 2,375 ft; 12,000,000 ft. gas 2,325-60 ft.
Boyes et al's No. 1 Colebank-Morse, 330 ft. NE, Sec. 65, Blk. 25, H.&G.N. Sur.	Spudded and S.D.
Brown et al's No. 1 Duncan, 330 ft. S and E, NW, Sec. 93, Blk. 3, I.&G.N. Sur.	Drlg. 3,500 ft.
Danciger O. & R. Co.'s No. 3 Byrum, 330 ft. from N line, 330 ft. from E line, Sec. 188, Blk. 3, T.&N.O. Sur.	Drlg. 3,240 ft; swbd. 70 bbls. in 11 hrs.; T.P. 3,110 ft.
Foster's No. 1 Webb, 330 ft. from S and W, Sec. 43, Blk. 25, H.&G.N. Sur.	Spudded.
Graham et al's No. 1 Barrett, 990 ft. from N, 330 ft. from E, Sec. 112, Blk. 3, I.&G.N. Sur.	Cellar.
Granite Prod. Co.'s No. 1 Chapman, 275 ft. from N line, 110 ft. from W line, S½ SW, Sec., of Blk. 26, H. &G.N. Sur.	Drlg. 225 ft.
Jean Pet. Co.'s No. 1 Furneaux Bros., 330 ft. N and W, cor. SE, Sec. 200, Blk. 2-B, H.&G.N. Sur.	S.D. 3,010 ft.; cleaned up fishing job.
Jewel Oil Co.'s No. 1 Moera, 330 ft. from S and W, NW SW, Sec. 106, Blk. 3, I.&G.N. Sur.	Drlg. 3,250 ft.
Nelson et al's No. 1 Crews, 330 ft. S and E, NW, Sec. 12, Blk. 25, H.&G.N. Sur.	S.D. 2,620 ft.; estimated 4,000,000 ft. gas.

(Continued on Page 138)

PRODUCTS B S&B SERVICE

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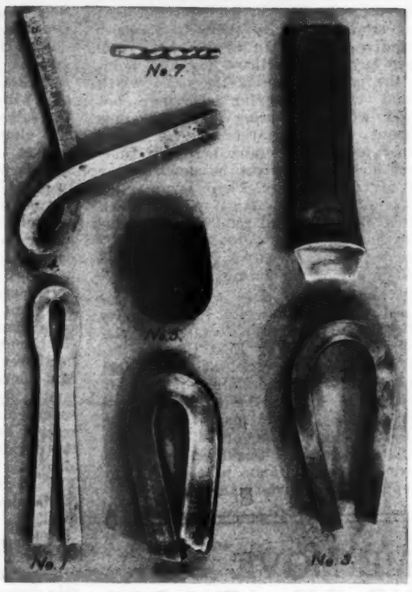
That Talks Back for Your Benefit



Ductility!

Another Factor in B. S. & B. FLEXWELDING

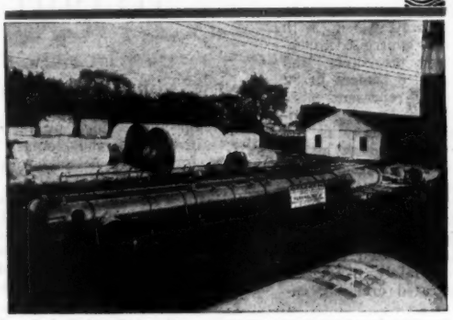
THE ductility and homogeneity of the welds made possible by our exclusive shielded arc weld process, are in marked contrast to the brittleness and lack of uniformity which has characterized open arc welds. To constantly test the ductility and toughness of the B. S. & B. FLEXWELDS, various bend tests were made, as shown in the photograph. These bend tests are one of the most sure and simple means of proving the character of the welds during the process of development. If fusion is not complete, the metal will break—not bend. If there is slag, or other inclusion in the weld, or if the metal is brittle or porous, the bend test will show it.

Bend tests demonstrating ductility and toughness of FLEXWELDS:

No. 1—Half-inch plate, 62½ per cent elongation of weld.
No. 2—Seven-eighths-inch plate, 53 per cent elongation.
No. 3—Same, 30 per cent elongation.
No. 4—½-inch plate, 62½ per cent elongation.
No. 5—Seven-eighths-inch plate, 60 per cent elongation.
No. 6—Polished cross section of weld shows homogeneity.
No. 7—Twist made entirely from weld metal.

"The Weld that Held"

DUCTILITY is only one of the fine phases of B.S.&B. FLEXWELDING, which complies with the recommendations of the Boiler Code Committee of the American Society of Mechanical Engineers. (The proposed new code requires a minimum elongation of 30 per cent for highest quality welds.) Each weld is as strong as the parent metal itself and the tensile strength is greater than that of the plate.



Heavy pressure vessels, refinery and other equipment are made in this shop to standard size, or to specification. Each is B. S. & B. FLEXWELDED and definitely guaranteed. Let our engineers design equipment for your requirements.

THIS is the first shipment of high pressure welded vessels to Quebec—two bubble towers and three separators sent to British-American Oil Company, Ltd., Montreal. The Quebec authorities had, heretofore, permitted no welded pressure vessels of over 100 pounds per square inch working pressure.

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Competition Makes An Open Market

Seventeen Major Companies Price Leaders but Economic Conditions Within Industry Preclude Possibility of Monopoly, Says Economist

NEW YORK, Mar. 26. — While certain major units in the petroleum industry are credited with normal price leadership in their respective territories, diversification in the control of gasoline production is so great that the major units have become impotent, in so far as monopoly or complete price control is concerned, according to Glen B. Winship, petroleum analyst, who for the past 15 years was connected with Sinclair Consolidated Oil Corp., and who recently concluded a two-year analysis of gasoline marketing conditions throughout the United States.

Although 17 major companies in the industry are credited with market leadership to a great extent, group markets are so interdependent that the law of supply and demand closely governs price levels, Mr. Winship's research disclosed. While these major units are unable to effectively control price structures, individual action by them in accordance with sound marketing principles would tend in large measure to effectually eradicate many of the trade evils which have crept into marketing policies during the period of supercompetition of the past few years, he believes.

Mr. Winship's findings are of particular interest in view of the recent charges in Congress that the larger oil companies have been moving prices for crude petroleum and refined products at will. While these big companies can lower prices, Mr. Winship states, they are unable to increase quotations beyond well defined narrow limits in any marketing area, because other refining areas are quick to ship supplies into territories where price levels are above a parity with the remainder of the country.

Summarizing the results of his investigation in an interview with The Oil and Gas Journal correspondent here this week, Mr. Winship said: "The four major factors in the domestic gasoline market are the Standard Oil companies of Indiana, New York, New Jersey and California. These organizations, with their subsidiary and controlled companies, are the leading marketers, and therefore the normal price leaders in 32 states which collectively represent more than 70 per cent of the domestic gasoline market. No other company is the normal price leader in as much as 10 per cent of the market. Yet these four companies, even though they were to act in concert, could not dominate the market except within narrow limits. Collectively, they have less than 35 per cent of the country's total operated refinery capacity, and approximately 37½ per cent of the total operated cracking capacity.

"Normal price leadership in the other 16 states is held by seven other companies, The Texas Company, Atlantic Refining Co., Standard Oil Co. of Ohio, Standard Oil Co. of Kentucky, Continental Oil Co., Gulf Refining Co. and Standard Oil Co. of Nebraska.

"A third group of six contains companies which are larger and have greater total sales than some of those in the second group, but their operations extend over a wider territory and they are not the normal price leaders in any state. Nevertheless, each member of this third group is a possible leader on the constructive side in more than 10 per cent of the domestic market and could exert considerable influence, especially as leaders of price declines. These six companies are Sinclair, Shell, Tide Water-Associated, Pure, Phillips and Union Oil of California. No other company could assert constructive market leadership in more than 5 per cent of the domestic market, although several others are potential unsettling factors.

"These 17 companies, acting individually in accordance with sound marketing principles, could eliminate some of the worst phases of present marketing conditions. Twelve of them could correct these conditions, although more time would be required. There is little chance of any fundamental improvement, however, unless the initiative is taken by members of the first group.

Refinery Markets

"The basis of the gasoline price structure is the refinery price in primary markets, although theoretically it might be based on the cost of crude oil. Careful analysis of price trends over a period of years indicates that only three refinery districts of the United States are properly regarded as primary markets, two as secondary markets and two as minor markets. The primary markets are those of the greater Mid-Continent (embracing Oklahoma, Kansas, Missouri, Arkansas, North Louisiana, and interior Texas), the Gulf Coast, and the Pacific, or California, area. The East Coast refining district, as a market factor, is subordinate to the Gulf Coast, just as the north central district is subordinate to the greater Mid-Continent. The Appalachian and the Rocky Mountain districts are relatively minor.

"Strictly speaking, the southeastern part of New Mexico should be included as an integral part of the Greater Mid-Continent, but the total refining capacity there is small and it is customary to place all that state in the Rocky Mountain district. There would be some justification for considering West Texas and southeastern New Mexico as a separate district, but little appreciable advantage would be gained thereby.

"Each of these seven refining districts has a normal sphere of influence. When these spheres are outlined on a map, it is clear that prices in all sections are affected more or less definitely by prices in all other sections, because the spheres of influence overlap. This makes it possible to calculate a range of wholesale and retail prices for any town or city which would be at a parity with prices in the rest of the country.

"So far as the wholesale market is concerned, the low point of this parity range is the price at which a local retailer could buy his supplies in a distant market at the same total price as that quoted by the local or nearby refiner. At this minimum parity there is no price incentive for him to change his customary buying connections. The high point of the parity range is the price which would warrant buying elsewhere but which would not bring in a dangerous amount of 'importation' unless maintained for a considerable period of time. This high point might be described as the maximum parity. There is an intermediate price or practical parity which would offer the local retailer a price incentive to buy elsewhere but not a sufficiently strong incentive to warrant the risk of buying for future delivery.

"When actual prices are not maintained within this parity range, profits necessarily suffer. For instance, wholesale prices posted by East Coast refiners could be maintained at a practical parity with Gulf quotations, unless that parity was higher than the practical parity of the Pacific market or of the greater Mid-Continent or of the Appalachian. Their prices might be maintained above the Appalachian practical parity except in the Appalachian sphere of influence, but they could not be maintained for any extended period above the Appalachian maximum parity, because even a minor market can force a decline. When actual prices are lower than necessary, the loss of revenue is direct; when prices are too high, outside competition is invited and the loss of revenue is indirect.

"Normally, the primary controlling factor in 16 eastern states is the Gulf Coast market, with the East Coast refiners in a strong but subordinate position. The Appalachian is a minor factor in less than half of this area, speaking from the consuming point of view rather than geographically. These 16 states represent slightly more than 34 per cent of the country's domestic market. In six additional states bordering these on the west, the Gulf Coast is the primary factor, with the greater Mid-Continent in the subordinate role. These states represent almost 11½ per cent of the domestic market, and in most of this area the Appalachian is an appreciable factor. In two additional states, Louisiana and Texas, the Gulf Coast market and the greater Mid-Continent meet on almost equal terms, part of each state being dominated by the Gulf Coast and part by the greater Mid-Continent. In 12 north central states which collectively represent almost 32 per cent of the country's domestic market, the greater Mid-Continent is the primary factor, with the north central refineries subordinate. The Mid-Continent sphere of influence overlaps a large part of the Rocky Mountain sphere also, but that entire sphere represents little more than 4½ per cent of the country's total, and it is overlapped also on the west by the Pacific factor. The Pacific market is the primary factor in almost 12 per cent of the country's total.

"The relative position which the 17 leading distributors hold in the wholesale market is reflected with a reasonable degree of accuracy by their percentage of total refining and cracking capacity. These percentages by refining districts, calculated from the latest available report of the Department of Commerce, are shown in the following table, the districts where they are weakest being placed first:

	Percentage of crude charging capacity (operated)	Percentage of cracking capacity (operated)
Greater Mid-Continent	38.21	51.38
Appalachian	56.65	67.00
Pacific	70.91	81.60
North Central	78.46	85.94
Rocky Mountain	84.04	84.96
East Coast	86.66	86.38
Gulf Coast	97.39	98.24
Averages	71.71	81.31

"In addition, members of the three groups of marketers control virtually the entire refinery output of the islands off the coast of Venezuela.

"These percentages indicate that the position of the 17 leading marketers is not so strong in the wholesale market as in the retail field, their relative weakness in the greater Mid-Continent placing a distinct limit to the extent of their possible control so long as conditions remain as at present. Obviously, the retail market cannot disregard the wholesale market with impunity, and it is unquestionably true that the potential influence of the leading marketers is progressively weakened in each of these markets as the spread between wholesale and retail prices is increased. The conclusion seems inevitable that anything even remotely resembling monopolistic control of gasoline prices is impossible under existing conditions. In fact there is ample basis for the assertion that the companies who are normal leaders are not exerting the degree of influ-

(Continued on Page 136)

FINANCIERS WELCOME MOVE TO QUIT SELLING OIL AT LOSS

By A. E. Mockler
New York Bureau, The Oil and Gas Journal

NEW YORK, Mar. 28.—Based on available data covering stocks of crude petroleum and refined products held in the United States, the increase in posted prices for crude petroleum (assuming that the advance initiated in the Mid-Continent spreads to the remainder of the country, as appears probable), coupled with increases in gasoline and heavy oil prices during the fortnight, will mean an appreciation of millions of dollars in the inventory position of the industry.

Financial circles here are closely watching the price trend in the petroleum industry, and it is believed that the current price revisions may mark a definite change in the pricing policy of producers and refiners.

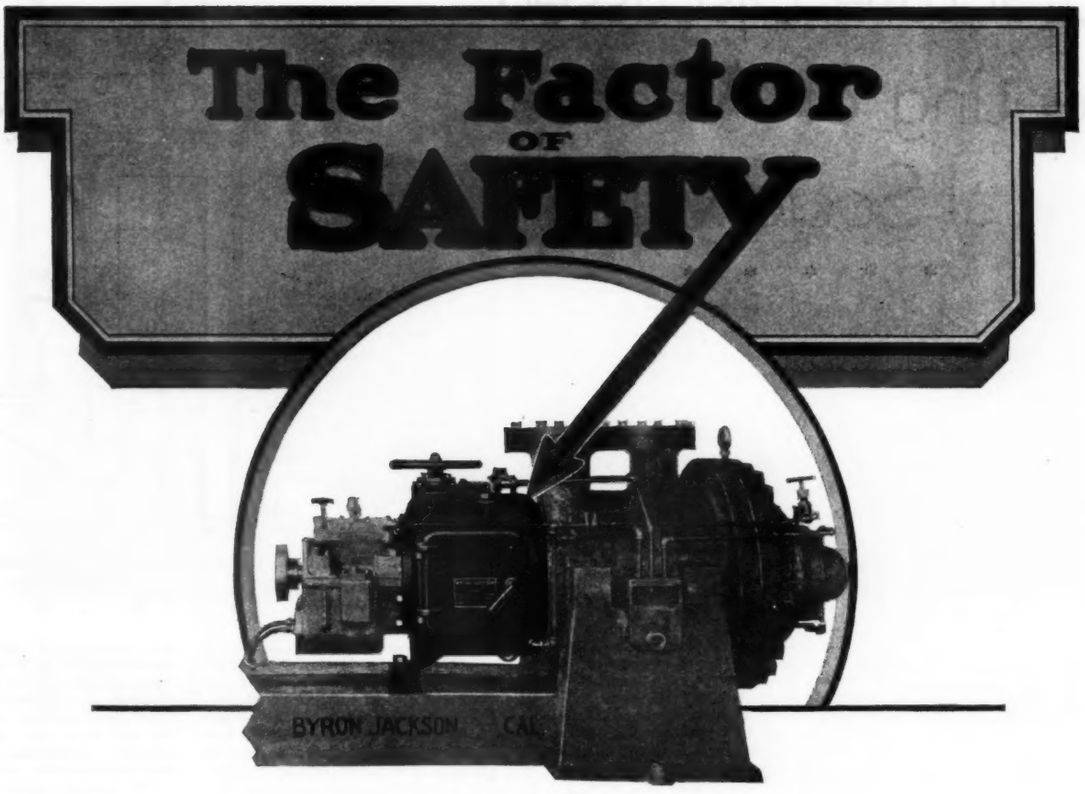
Interests here which are called upon from time to time to finance the expansion of petroleum companies have long felt that a drastic change in the pricing policy of oil companies was needed, and have been urging the advisability of immediate action looking toward the correction of some of the uneconomic policies which have forced producers and refiners to sell at a loss, oftimes to meet "phantom competition."

For the past few years it has been evident to many that the marketing division of the petroleum industry was sadly lagging behind the producing and refining groups in the matter of efficient operation. Marketing policies at times, even on the part of some of the largest companies in the industry, have savored more of hysteria than economics, and the rush to meet "competition," has been little short of ludicrous in many instances.

Hundreds of millions of dollars have been spent by refining and marketing companies in the creation and maintenance of good will for their products. Presumably, this good will is now an actuality, a fixture in the assets of these companies. Despite this logical assumption, however, marketing divisions have continuously operated on the theory that price is the sole and paramount consideration on the part of the consumers of refined products. Apparently, to judge from the attitude of the marketing branch, the good will and followings built up for advertised trade-marked petroleum products is so much chaff, dissipated by the first competitive breeze stirred up by an unknown, nameless competing product, often of inferior quality.

As the situation is viewed here, too many oil companies have been casting about for life belts in the form of Government regulation, world compacts, and other devices, when it would have been far simpler to look for the leak in their own organizations, plug the gap in their marketing departments, and turn the results of their refining and marketing activities into black instead of red ink.

The petroleum industry, as a unit, has written off its inventories to rock bottom, and recent price advances have already put their 1932 operations on a favorable basis. They are on a sound footing to continue this improvement in their statistical and financial positions. It remains merely a question of whether, with a full realization of the situation, the industry chooses to step ahead on the right or the wrong foot.



THE Byron Jackson Hot Oil Charging Pump has brought added safety to refinery operation by complete elimination of danger from the dreaded flash.

This is accomplished by steam smothering in an enclosed chamber, housing the packing gland of the pump, controlled by an external hand wheel. The packing gland is kept filled with exhaust or wet steam while the pump is in operation. No operator has ever been injured by a flash or explosion in one of these pumps.

Special Features: Stuffing box extra deep, provided with cage ring at center for cold oil sealing. Packing gland actuated by means of lever, link and spring mechanism controlled by external hand wheel for safety of operator. Stop pin prevents unintentional complete removal of gland from stuffing box. Packing gland mechanism enclosed in cast iron housing to permit steam smothering of vapors escaping through stuffing box. Vent pipe leads away steam and fumes. For full details write for Bulletin 314.

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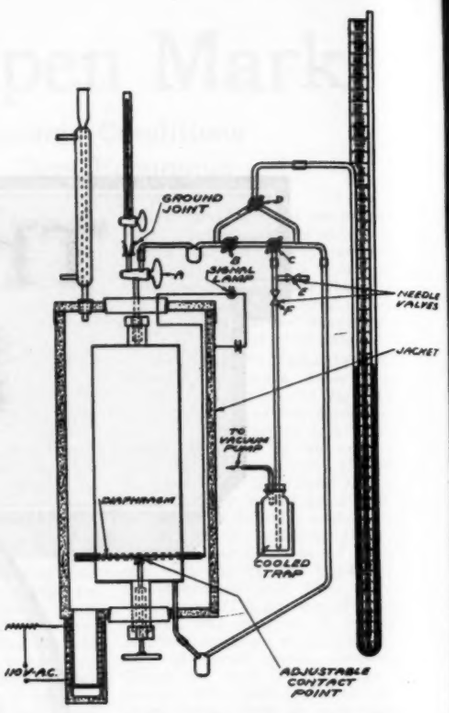
BYRON JACKSON

CENTRIFUGAL PUMPS FOR EVERY SERVICE

Technical Phases of Manufacture Discussed in Meeting of American Chemical Society This Week

* * * * * *

NEW ORLEANS, La., Mar. 30.—"While the automobile of 10 years ago consumed approximately 61 bbls. of crude annually, the automobile of today requires but 41 bbls." This fact was pointed out by Dr. R. T. Haslam, of the Standard Oil Development Co., as chairman of the symposium on the "Chemical Engineering Processes in the Oil Industry," during the eighty-third annual meeting of the American Chemical Society in session here this week. This, of course, has been accomplished by the co-operation of the refining and automotive engineers but the principal factor has been the large increase in the production of motor fuel from each barrel of crude as the result of the universal adoption of cracking. During this time the output of cracked gasoline has increased until it nearly equals that recovered from crude direct. In 1931 the output of cracked gasoline was 176,181,000 bbls. and of straightrun, 220,263,000 bbls. Other contributing factors have been the development of vapor tight storage, the recovery of light fractions from natural gas in the gasoline plant and in the refinery, the manufacture of better lubricants, and many other practices which now form a natural part of the routine of operation. The progress the industry has shown in the past simply serves as a suitable background for the discussion of the new research work going on now and the technical papers presented show the variety of the research under way.



Apparatus for rapid molecular weight determinations.

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The program of the convention provided for the regular meetings of the petroleum section and the symposium mentioned. The meetings of the petroleum section were held under the chairmanship of C. R. Wagner of the Pure Oil Co.

One of the papers presented before the chemical section which proved of exceptional interest was that prepared by Dr. F. T. Gardner of the University of Tulsa and E. C. Higgins, Jr., of Long Beach, Calif. This paper deals with the use of magnesium hydroxide as a treating reagent. While the commercial possibilities are being fully investigated, the author is already able to draw the following definite conclusions:

"1. Passage of hydrocarbon mixtures containing phenols and H_2S over granular $Mg(OH)_2$ results in the removal of these impurities until the surface of the granules is eventually coated by film of reaction products.

"2. The employment of $Mg(OH)_2$ in the form of suspension makes possible ready removal of high concentrations of H_2S from hydrocarbon mixtures when employed in a series of extractions.

"3. Passage of liquid hydrocarbon mixtures, which have been treated with H_2SO_4, over granular $Mg(OH)_2$ results in the neutralization of that mixture until the surface of the granules is eventually coated by a film of reaction products.

"4. $Mg(HS)_2$ is readily hydrolyzed at the boiling point of the suspended solution, making possible the recovery of $Mg(OH)_2$ from the spent material.

"5. Magnesium basic mercaptides, gasoline soluble, are formed when a gasoline containing mercaptans is passed through a column of dry $Mg(OH)_2$; elementary S reacts with these compounds converting them to disulphides.

"6. Spent $Mg(OH)_2$ from the mercaptan alteration process may be regenerated by boiling with water, boiling with NaOH, washing twice with water and drying."

Doctor Gardner gave the following reasons for choosing magnesium hydroxide:

"The use of alkali in the petroleum industry is principally confined to the treatment of large volumes of gas or liquid containing a small percentage of undesirable acidic impurities. The application of a base in solid granular form, over which the liquid or gas undergoing treatment may pass, offers the possibility of furnishing a long operating cycle with a minimum of handling expense.

"Such a base must be sufficiently nonfriable that the granules will not tend to decrease rapidly in particle size, with resultant packing to a pasty mass, under the burden which the base must sustain when packed in a tower for treating purposes. The base, obviously, must be nonhygroscopic.

"Further, if the base may be revivified readily, in situ, when the surface of the granules has become coated by products of the reactions occurring in the treating process, the use of the solid base in packed towers should represent economical plant practice.

"Magnesium hydroxide possesses the qualifications of the base described[1]. Mined as the mineral brucite, magnesium hydroxide has a hardness of 2.5 on Moh's scale. Magnesium hydroxide may also be prepared by hydration of magnesium oxide, prepared by calcination of magnesite. The oxide employed for the purpose should contain 90 to 95 per cent magnesium oxide, show less than 3 per cent ignition loss, contain less than 2.5 per cent insoluble matter and should not be "dead burnt," since ready hydration is desired. The hydration of granular magnesium oxide furnishes a nonfriable hydroxide mechanically satisfactory as tower packing.

"Brucite is found in commercial quantities at Luning, Nev., and Chewelah, Wash. Seaton has recently discussed Pacific Coast magnesite deposits.

"The salts formed by the reaction of magnesium-hydroxide with weak acids are subject to hydrolysis to a marked degree, due to the slight solubility of the base. In employing a tower packed with magnesium hydroxide to remove weak acids from liquid or gaseous petroleum products, the magnesium salts formed are incrementally deposited on the surface of the base and thus the acids are removed as passage through the tower occurs until after contact with a large number of successive surfaces, the amount of free acid becomes vanishingly small. Thus, even though the process of salt formations is never complete, removal of successive increments of nonvolatile hydrocarbon insoluble salt as formed, results in eventual neutralization of essentially all free acid.

"If the concentration of weak acid is appreciably large, it is conceivable that the use of solid base may not represent the most economical method of application; that is, the surface of the magnesium hydroxide will become coated with a film of reaction products so rapidly that the time to vitiation will be too short to allow for effective plant operation. The use of magnesium hydroxide as a thin suspension is to be preferred in such cases. Several successive extractions with small amount of suspension will give effective removal of acidic materials as will be shown subsequently.

"The ease of hydrolysis of magnesium salts of volatile weak acids makes possible ready recovery of the base from such salts. Boiling of salts of this type for a few minutes will result in expulsion of virtually all of the acid, leaving the magnesium hydroxide available, after cooling, for reaction with further weak acid.

"Magnesium hydroxide has been found to date to be adaptable to four processes carried out in the petroleum industry: phenol removal, hydrogen sulphide removal, neutralization of acidified stocks and conversion of mercaptans to disulphides, "sweetening."

Another paper which proved interesting because of the growing application of molecular weight determinations on different oil fractions as a basis for designing equipment, etc., was that on the "Rapid Method for Determining Molecular Weights of Petroleum Fractions" by K. M. Watson and Charles Wirth. In it the authors pointed out that the present methods now in general use could not be readily modified to produce an apparatus which could be used to give rapid routine results. In discussing the new apparatus recommended for the rapid determinations the authors said.

"A method utilizing determination of vapor densities at reduced pressures and an elevated temperature appears most promising. Preferably the liquid sample should be volumetrically measured and the manipulation should not require highly developed technique. These requirements are best fulfilled by an apparatus of constant volume which may be evacuated at a high temperature and to which measured liquid samples may be added and the resultant pressures measured. The principal problem in developing such an apparatus is that of measuring the pressure without connecting the vaporization chamber to any cold manometer or gauge in which condensation may occur. The temperatures desirable for the vaporization of many petroleum fractions are too high to permit the use of a hot mercury manometer without troublesome details resulting from vaporization of the mercury.

"To obviate these difficulties an apparatus has been developed in which pressure is measured by means of an auxiliary gas-filled compartment. A manometer is directly connected to this compartment in which the gas pressure may be adjusted to exactly equal the pressure of the vapors in the adjacent vaporization chamber. The equalization of pressures is accomplished by means of a metal diaphragm and signal lamp. With this apparatus the molecular weight of a volatile petroleum fraction may be determined with a time consumption of the order of 15 minutes per determination.

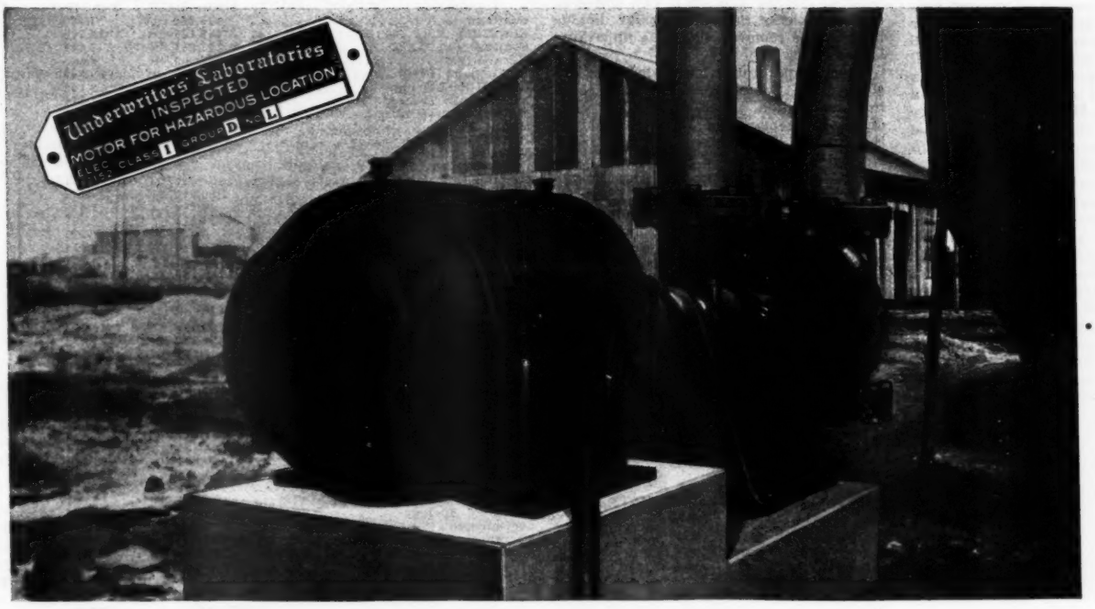
Molecular Weight Apparatus

"A diagram of the apparatus is shown in Figure 1. It consists essentially of a vaporization chamber divided into two parts by means of a thin metal diaphragm. The diaphragm is electrically insulated from the remainder of the apparatus and carries a tungsten contact point on the center of its lower face. Below this point another contact is supported on an adjustable shaft which is grounded to the apparatus. An incandescent signal lamp and dry cell are connected in series with the two contact points. The position of the lower contact is then so adjusted that when the pressures in the two compartments are equal the electrical circuit will be just opened.

"The top compartment of the apparatus is connected to a three-way capillary glass stopcock through a compression type packing gland. A small burette containing the unknown sample is connected to one branch of the stopcock through a ground joint. The other branch of the stopcock leads to a glass manifold so arranged that the upper compartment may be connected to a closed-end manometer, a vacuum pump or to the atmosphere. The lower compartment of the apparatus has a single outlet through a copper tube which is also connected to the glass manifold system through a small trap.

"The entire vaporization chamber is surrounded by a double walled insulating

[1]U. S. and foreign patents pending. Owned or controlled by Process Development Co.



The Cost of a Building Saved *through the use of this* Explosion-Proof Motor

APPROVED explosion-proof motors are being used more and more throughout the petroleum industry. Especially are they saving costs and eliminating hazards in the refineries. The Allis-Chalmers motor illustrated above, driving a gasoline pump in the Waggoner Refining Company's plant at Electra, Texas, saved the cost of a brick building with concrete floor and fire wall between pump and motor. It provides a drive that has the complete approval of the Underwriters' Laboratories.

Mechanical details of this motor are described in Leaflet 2125A. May we send you a copy?

ALLIS-CHALMERS

Allis-Chalmers Manufacturing Company, Milwaukee

jacket in which a constant and uniform temperature is maintained by the vapors of a boiling liquid. The liquid is boiled in an electrically heated vessel at the bottom of the jacket. At the top a reflux condenser is so mounted that the cold reflux is returned to the boiler without dropping on the vaporization chamber. It has been found most satisfactory to use a petroleum fraction of narrow boiling range as the heating medium. These fractions are prepared by taking small cuts from an intermittent type crude still and refractionating these materials in a laboratory Hempel column to obtain a product having a Hempel boiling range of 3° C. Using cuts prepared in this manner, the temperature variations in the vapor jacket did not exceed 2° C.

"In starting a determination the apparatus was first heated until reflux was steadily returned to the jacket. With the upper and lower compartments partly evacuated the movable electrical contact was so adjusted that if the pressure in the upper compartment was initially greater than that in the lower, the signal lamp would be extinguished when the pressures were equalized by admitting air to the lower compartment. This adjustment was frequently checked and stressing the diaphragm with large pressure differences was avoided as much as possible. With this arrangement it was found possible to determine the pressure in the upper compartment with an error of less than 1 mm. of mercury by connecting the manometer to only the lower compartment.

"The sample was placed in the burette after the entire apparatus had been evacuated as completely as possible with a high vacuum oil pump. Initial readings of the burette and manometer were recorded and stopcock B set in the closed position and stopcocks D and C set to connect the lower compartment to both the manometer and the vacuum pump. A small amount of sample was then admitted by turning stopcock A. Air was slowly introduced to the lower compartment through needle valve E until the signal lamp was extinguished, keeping valve F closed. The pressure reading was recorded and valve F opened until the signal lamp was again lightd. Air was then again admitted to the lower compartment until the light was extinguished and the pressure reading verified. Another small sample was then introduced from the burette and the pressure measurement repeated. This procedure was continued until the pressure reached 400 or 500 mm. of mercury or until there was indication of condensation in the vaporization chamber. Condensation was indicated by diminished increases in pressure as additional sample was introduced.

"From each observation of burette reading and pressure, a value of the apparent molecular weight was calculated, assuming the validity of the simple gas law. The temperature in the vapor jacket was measured during each determination and the volume of the vaporization chamber was taken as constant. This volume was calculated from data obtained in a determination on distilled water."

Use of Low Boiling Solvents

In carrying out the work of separating the various groups of hydrocarbons in petroleum, R. T. Leslie read a paper describing apparatus he had developed for laboratory use to continuously effect this. His statement in briefly outlining the problem was:

"Sulphur dioxide is one of the best known extractants which has the property of selectively dissolving certain types of hydrocarbons, and considerable technique has been developed for its use both on a commercial and on a laboratory scale. After some consideration, however, it was decided that improvement could be made in the laboratory apparatus.

"The apparatus which has been developed, although intended primarily for use with sulphur dioxide, can be used with any low boiling solvent, the density of which is greater than that of the material to be extracted. For use with solvents whose densities are less than that of the hydrocarbon, some modification is necessary, but the same principles can be used."

Two forms of the apparatus were described. The first type is entirely of glass and is the simpler, but must be operated at temperatures below the boiling point of sulphur dioxide. The second type is of metal and may be operated at temperatures above the normal boiling point of sulphur dioxide. It also possesses the convenience that the sulphur dioxide need not be removed when the apparatus is not in use.

Other important subjects discussed include "The Solubility of Ethyl Alcohol in Gasoline," a paper prepared by Dr. O. C. Bridgeman and Dale Querfeld of the Bureau of Standards; "Isolation of Normal Decane From Petroleum Distillation and Equilibrium Melting Point" by Johannes H. Bruun and Mildred H. Hicks-Bruun. The latter authors also prepared a paper on the "Isolation and Determination of Normal Heptane and of Methylcyclohexane in a Mid-Continent Petroleum." Loe D. Jones of the Sharples Specialty Co. also read a paper of considerable practical value at present. This deals with the "Centrifugal in Acid Treating Petroleum Lubricants."

WEST TEXAS FIELDS

(Continued from Page 32)

this county, or an extension of the former area.

DAILY AVERAGE OIL SHIPMENTS FROM WEST TEXAS

Week Ending March 24

Shipments Through Main Trunk Lines

Company, size and location—	Bbls.
Atlantic P. L. Co., 10-in., Houston	17,675
Gulf P. L. Co., 10-in., Ranger	none
Humble P. L. Co., 2-8-in., San Angelo	31,572
Humble P. L. Co., 12-in., Station "A"	49,868
Illinois P. L. Co., 2-8-in., Del Rio	26,112
Magnolia P. L. Co., 8-in., DeLeon	none
Shell P. L. Corp., 10-in., Cushing, Ok.	28,205
Shell P. L. Corp., 10-in., Houston	12,159
Texas P. L. Co., 12-in., Houston	15,721
Total	181,312
Tank car shipments	none
Shipments to refineries	22,225
Total daily avg. distribution	203,537
Daily avg. production (including Lea County, New Mexico)	208,112
Daily average to storage	4,577

PERU MAY NATIONALIZE PETROLEUM INDUSTRY

NEW YORK, Mar. 28.—Peru will nationalize the petroleum industry in that country if a bill providing an oil monopoly now before congress is adopted. Under the provisions of the pending measure oil companies operating in Peru would be required to sell their oil lands and plants to the government the bill appropriating $20,000,000 for that purpose. Profits of the monopoly would be limited to 10 per cent of the capital plus a bonus for increased sales. The monopoly would be required to guarantee the treasury a daily payment of not less than its present income from petroleum but would be exempt from taxes.

Standard Oil Co. of New Jersey is the major American operator in Peru through Imperial Oil, Ltd., which controls International Petroleum Co., Ltd., Peruvian operating company. International operates a refinery in Peru and handles much of the domestic business, exporting its surplus crude production to Canadian refineries of Imperial Oil.

CASINGHEAD HEARING

AUSTIN, Tex., Mar. 28.—The Railroad Commission has reset for hearing at Austin April 5 application of Hagy, Harrington and Marsh, Amarillo natural gas operators, for authority to strip gasoline from casinghead gas at its wells in the Texas Panhandle, and to burn the residue gas in carbon black production.

The firm, in its request for this authority, contended that out-of-state gas utility competitors, having the only pipe line from the field, were preventing production by independents and small operators, and were tending to acquire a monopoly on the gas business and to drain valuable gas from leases of competitors.

CALIFORNIA OIL FIELD OPERATIONS FOR FEBRUARY

According to figures collected by the American Petroleum Institute, Pacific Coast office, the total production of crude oil in California for February amounted to 14,616,862 bbls., an average of 504,030 bbls. per day. This is an increase of 2,993 bbls. per day over January production.

CRUDE PETROLEUM PRODUCTION

(Figures of production and stocks are in barrels of 42 gallons)

Group No. 1—	Bbls. per month	Daily average Feb., 1932	Daily average Jan., 1932	Daily average Feb., 1931
Coalinga	216,330	7,460	7,302	8,743
Elk Hills	369,158	12,730	12,662	14,645
Fruitvale	111,551	3,847	3,598	2,101
Kern River	277,969	9,585	9,834	11,140
Kettleman Hills	1,735,529	59,846	60,265	26,856
Lost Hills-Belridge	264,704	9,128	9,719	6,514
McKittrick	52,600	1,814	1,734	3,741
Midway-Sunset	1,430,823	49,339	48,668	53,399
Mount Poso	234,814	8,097	8,191	7,511
Round Mountain	63,689	2,196	1,278	233
Wheeler Ridge	15,159	523	531	536
Group No. 2—				
Capitan	.....	.....	.....	681
Elwood	486,241	16,767	16,430	31,110
Rincon	46,686	1,610	1,630	2,177
San Miguelito	14,311	493	342	.....
Santa Barbara	8,422	290	313	356
Santa Maria	77,546	2,674	2,532	2,597
Summerland	3,508	121	108	168
Ventura Avenue	1,135,157	39,143	40,387	44,494
Ventura-Newhall	104,675	3,610	3,559	3,885
Watsonville	1,812	63	62	62
Group No. 3—				
Coyote	298,799	10,303	9,712	10,442
Dominguez	420,443	14,498	15,125	11,814
Fullerton (Brea Olinda)	256,373	8,840	8,989	10,417
Huntington Beach	642,187	22,179	22,125	21,498
Inglewood	401,684	13,851	13,762	15,302
Lawndale	8,298	286	235	203
Long Beach	2,359,686	81,368	77,888	94,914
Los Angeles-Salt Lake	35,299	1,217	1,165	1,440
Montebello	182,816	6,304	6,235	7,087
Newport	121	4	22	40
Playa Del Rey	560,284	19,320	20,182	32,658
Potrero	24,928	860	992	884
Richfield	178,336	6,150	6,459	7,004
Rosecrans	92,346	3,184	3,109	4,803
Santa Fe Springs	1,919,977	66,206	65,292	71,253
Seal Beach	374,394	12,910	13,296	14,943
Torrance	180,432	6,222	6,228	6,009
Whittier	28,775	992	1,066	1,362
Total February	14,616,862	504,030	501,037	533,248
Total January	15,532,141	501,037		
Decrease	915,279	*2,993		

*Increase.

TOTAL STOCKS HELD BY CALIFORNIA OIL COMPANIES, BOTH INSIDE AND OUTSIDE THE UNITED STATES

	Feb. 29, 1932	Jan. 31, 1932	Feb. stock Increases	Feb. 28, 1931
Heavy crude and all grades of fuel, gas and Diesel oils	98,806,315	98,914,561	†108,246	103,491,323
Refinable crude	42,167,334	42,302,110	†134,776	43,340,921
Finished gasoline, engine distillate and natural gasoline	17,818,437	16,621,657	1,196,780	18,380,477
Crude gasoline and naphtha distillates	4,788,185	4,353,539	434,646	3,339,904
All other stocks	*8,001,919	‡8,252,187	†250,268	$10,032,925
Total all stocks	171,582,190	170,444,054	1,138,136	178,585,550
Barrels of coke included	*648,778	‡636,449		$709,744

†Decrease.

OIL FIELD DEVELOPMENT

Group No. 1—	New rigs up	Active drilling	Producers completed	Daily initial output	Active producing	Abd. wells— Drillers	Abd. wells— Producers
Coalinga	0	0	0	0	639	0	0
Elk Hills	0	0	0	0	208	0	0
Fruitvale	7	4	2	670	24	1	0
Kern River	0	1	0	0	895	0	0
Kettleman Hills	1	12	1	1,750	23	0	0
Lost Hills-Belridge	0	2	0	0	159	0	0
McKittrick	0	2	0	0	126	0	0
Midway-Sunset	0	1	0	0	1,757	1	1
Mount Poso	0	2	0	0	73	0	0
Round Mountain	2	1	1	440	10	0	0
Wheeler Ridge	0	0	0	0	34	0	0
Group No. 2—							
Capitan	0	0	0	0	0	0	0
Elwood	0	0	0	0	42	0	0
Rincon	0	0	0	0	33	0	0
San Miguelito	0	0	0	0	2	0	0
Santa Barbara	0	0	0	0	3	0	0
Santa Maria	0	1	0	0	169	0	0
Summerland	0	0	0	0	62	0	0
Ventura Avenue	1	7	0	0	143	0	0
Ventura-Newhall	0	3	0	0	448	3	0
Watsonville	0	0	0	0	6	0	0
Group No. 3—							
Coyote	1	4	0	0	160	0	2
Dominguez	2	3	1	2,036	53	0	0
Fullerton	0	1	0	0	358	0	0
Huntington Beach	0	2	0	0	361	0	1
Inglewood	0	2	0	0	209	0	0
Lawndale	0	1	0	0	7	0	0
Long Beach	1	11	1	270	943	0	0
Los Angeles-Salt Lake	0	0	0	0	260	0	0
Montebello	0	1	0	0	178	0	2
Newport	0	1	0	0	2	0	0
Playa Del Rey	1	1	2	690	185	1	0
Potrero	0	2	0	0	12	0	0
Richfield	0	1	0	0	142	0	0
Rosecrans	0	0	0	0	64	0	1
Santa Fe Springs	0	0	1	65	478	0	0
Seal Beach	0	1	0	0	102	0	0
Torrance	0	0	0	0	358	0	1
Whittier	0	0	0	0	171	0	0
Miscellaneous drilling	3	50	0	0	0	11	0
Group No. 4—							
Buttonwillow gas field	1	3	1	gas	1	0	0
Dudley Ridge gas field	0	4	0	0	1	0	0
Goleta gas field	0	1	1	gas	0	0	0
Total February	20	125	11	5,921	8,900	17	8
Total January	15	124	16	8,789	8,727	20	19
Increase	5	1	*5	*2,868	173	*3	*11
Average for year 1931	22	207	21	30,370	8,911	20	15
Average for year 1930	80	434	63	48,710	9,632	21	27
Average for year 1929	109	610	76	100,625	10,550	26	18

*Decrease.

Increased Demand for Oklahoma Crude

Production Gains in Past Week and Preparations Are Being Made for Big Consumption Season. New Production Rules

By W. A. Spinney
Staff Correspondent, Oklahoma Fields

The daily average production from Oklahoma shows a substantial gain from the previous week amounting to approximately 14,700 bbls. daily. The average daily production was approximately 435,300 bbls. A 20,000-bbl. increase was reported from the Oklahoma City Field. Activity has increased in the State and particularly in the Oklahoma City Field where 10 new locations were announced and permits for five additional town lot wells were granted by the City Commission. This is the greatest number of new operations announced in any one week in the Oklahoma City Field in nearly a year.

Pontotoc County is also active and is second to the Oklahoma City Field in activity. Both the Conservation Pool and the old Beebe area are being tested. The majority of the new development work in the Conservation Pool, is in the vicinity of the discovery well drilled by the Barnsdall Oil Co. in Section 21-5-6. The Pioneer Oil Co.'s No. 1 Bayne, NE cor. SW SW, Section 16-5-6, a wildcat test, found a showing of gas at 1,144-51 feet estimated at 3,000,000 feet a day in the Wewoka sand. The casing will be reamed in order to shut off the gas and drill the test deeper.

Crude Demand Increases

An emergency order increasing the daily allowable flow of the Oklahoma City Field 10,000 bbls. was issued by the corporation commission, effective Thursday at 7 a.m., to meet the urgent demand of purchasing companies, and gives the field maximum outlet of 115,000 bbls. daily.

The former allowable production of the field was 105,000 bbls. but the average production has been approximately 92,000 bbls. a day and the balance has been coming from the deferred and current underage in lease storage. It is expected that field stocks will be exhausted by April 15.

The increase in the daily allowable followed the announcement that the Continental Oil Co. will increase the price of crude oil on April 1 at 7 a.m. The increase is to be 15 cents a barrel on all grades.

Around the first of April the Oklahoma Pipe Line Co. expects to complete its booster station near Wellston, on its pipe line system between the Oklahoma City Field and Drumright. It is now looping its gathering system in the Oklahoma City Field on the east and west sides of the field and it is expected to increase its purchases to approximately 27,000 bbls. daily around April 1.

The Continental Oil Co. has been gradually increasing its purchases in the Oklahoma City Field and is expected to take more oil later. It is believed the Shell Pipe Line Co. is considering increasing its purchases in the field also.

Phillips Increases Facilities

Phillips Petroleum Co. announced that plans for the construction of a 6-inch welded pipe line from the Oklahoma City Field to its connections and storage farm on the Knappenberger lease, 1 mile east of Earlsboro in Section 8-9-5, Pottawatomie County, have been completed. The line will be about 45 miles long. It will connect with the company's system which now runs to the Knappenberger lease from the Okmulgee refinery. It will permit the company to handle its own production in the Oklahoma City Field and ship it to the refinery. It will have a capacity of 6,000 bbls. a day at the start, but can be increased to approximately 18,000 bbls. a day by the installation of pumping units. The construction contract was awarded to Kelly-Dempsey & Co., and the carrier is expected to be completed by May 15.

Big Storehouse of Oil

The future development of the Oklahoma City Field is considered favorable. The Wilcox sand zone is believed to be the largest yet found in the State in a single Pool and some estimate that it will cover 5,000 or more acres. Up to the present time only 2,100 acres, or 40 per cent, have been developed. Only 5 of the 312 producers in the Wilcox sand zone show traces of water. The 312 Wilcox sand wells are spaced approximately on a basis of 7 acres per well and if the balance of the development is on a basis of 10 acres per well, it means that approximately 200 more wells will be drilled to cover the estimated 5,000 productive acres.

The ultimate recovery of the Wilcox sand zone has been estimated at 75,000 bbls. per acre. The average thickness of the sand is around 115 feet, a record equalled by no other body of Wilcox sand yet uncovered in the State.

Water encroachment has been retarded to some extent in the Simpson sand zone in the field and some express the opinion that it is not a detriment at this time. The Simpson sand zone is estimated to cover around 5,900 acres, of which 4,900 acres, or 82 per cent, has been developed to date. The 421 producers in that area show a potential for 24 hours of 1,903,000 bbls. A total of 78 wells are showing water in the Simpson sand zone.

There were a total of 887 wells completed in the field and with an additional 200 wells in the Wilcox sand zone and 100 more wells in the Simpson sand zone will give the field a total of approximately 1,200 wells when the field is fully developed.

Military Will Continue

Operators of the Oklahoma City Field approved suggestions for proration changes in the field, and agreed to put the military force now in the field under the executive order of Governor Murray, on the pay roll of all the operators on the first of April. Heretofore the military force has been paid by only a few of the operators in the field.

Ray M. Collins made the suggestion for the retention of the military after his employes had been forbidden passage on two leases in the field and he felt more authority was needed. Some objection was raised to the change but 23 of the operators voted to place the troops on the umpire's pay roll.

The operators voted approval of the list of suggestions and recommendations for changes in proration of the field. Objections were raised on some points, but the majority vote was in favor of the changes.

After the session Ray M. Collins said that he would send the original list of suggestions and the objections to the Oklahoma Corporation Commission for its approval, and they will be considered at the next regular meeting March 28, when the hearings on the allowables will be discussed.

Chief objection to the suggestions came in the matter of allocations of production to water wells and those classed as minimum wells.

Under the new classifications there are four groups of wells: Lime wells, with a flat allowable to the entire zone; water wells, with an allowable of 1¼ bbls. for each 1,000 bbls. outlet for the field; minimum wells, which would have an allowable of one-half barrel per 1,000 bbls. outlet; and potential wells, the allowable of which would be based on a percentage of its potential.

One of the committee of five gave the following figures on the allowable per well and compared it with the present allowable and assuming that there is no underproduction and that the lime and flat allowables remain the same:

If the field has an outlet of 106,000 bbls. a day, virtually the present allowable, the water wells would be allowed 128 bbls. a day as against 157 bbls. at present; the minimum wells, 51 bbls. as against 44 bbls. at present, and the potential wells would have 214 bbls. a day as against 212 bbls. as at present.

Under the same conditions, with a field allowable placed at 200,000 bbls. a day, the water wells would have an outlet of 246 bbls. a day compared to 311 bbls. as under the present rules; the minimum wells would have 98 bbls. as compared to 86 bbls. at present, and the potential wells would have 410 bbls. a day compared to 402 bbls.

It is recommended that potentials be taken in the field each six months with the first to start on June 1. It is estimated that there will be 364 wells exempted for potentials at this time. There are now 278 wells each with a potential of 2,000 bbls. or more a day in the field.

It was the opinion of some that the underproduction should be given preference in allocating the shipments from the field, but Umpire Collins is of the opinion the present deferred underage will be out of the way in another three weeks.

The present rule permitting changing of allowable from high ratio wells to low ratio wells was upheld. It was further voted to permit the erection of derricks and the building of foundations and cellars and the 58-day shutdown would apply before beginning work in lieu of the shutdown time after the completion of the well. Reconditioning of wells will be permitted and the umpire is authorized to require daily reports on the volume of gas taken by a purchaser from any specified property.

Commission's Latest Order

The State Corporation Commission issued orders restricting the manner in which casing is to be landed in all wells drilled in the Oklahoma City Field after April 10. The commission finds that it has been the practice of some operators in the field to land a string of casing at approximately 2,000 feet and to set the next string of casing at or near the Wilcox sand or some lower producing horizon at a depth of approximately 6,500 feet, thus leaving approximately 4,500 feet of open hole between the point where the flow string is set and the point at which the next larger string of casing is landed. Between these depths of 2,000 feet and 6,500 feet lie a number of sands known to contain oil and gas in large quantities including the Hoover sand, the upper Tonkawa, the Layton and the Oswego lime and the Pru sand. There also occurs between the said depths sands known to contain water and that the distance of approximately 4,500 feet occurring between the points at which the two strings of casing are set is so great that it cannot be certainly known and in fact is impossible that the cement placed around the last flow string reaches high enough to effectively seal the various oil and gas or water bearing horizons. It is believed that in wells so cased, water is migrating from water sands into the oil and gas bearing horizons.

The commission further finds that this casing practice leaves large amounts of water in contact with the last string of casing by reason of which any defect in or injury occurring to the casing in connection with the operation or repair of such well or corrosive action of water therein is likely to permit the water to reach the Wilcox sand or other lower producing horizons. Within the area in which the Wilcox sand and lower Simpson sands produce oil, all sands known to contain water above the Wilcox sand lie above the horizon known as the Checkerboard lime, which occurs in all the areas of the

(Continued on Page 142)

WILDCAT OPERATIONS IN OKLAHOMA

NORTHERN OKLAHOMA

ALFALFA COUNTY

Company, farm and location—	Remarks:
Smith Brothers' No. 1 Forbes, SE cor. NW NW Sec. 12-27-11w	S.D. 1,232 ft.
J. W. Bailey's No. 1 Acre, SW cor. NE Sec. 14-24-11w	S.D. 5,502 ft.

BECKHAM COUNTY

Pattel Royalty's No. 1 Goose Tree, SW SE SW SE Sec. 32-10-23w	Rig.
Price-McFann's No. 1 Webster, C SW SW Sec. 34-8-26w	T.D. 2,344 ft.; plugged back to 1,890-1,900 ft.; 1,500,000 ft. gas.
Mid-Continent's No. 1 Schaff, C NE SW Sec. 22-11-22w	Waiting on cmt. to set 430 ft.
Mid-Texas Co.'s No. 1 Sidell, NE cor. SW SW Sec. 17-22-22w	S.D. 2,550 ft.
White et al's No. 1 Green, SW cor. Sec. 34-10-24w	S.D. 3,575 ft.

BLAINE COUNTY

Washoma Oil Co. et al's No. 1 Phillips, C NW SW Sec. 13-19-10w	S.D. 5,115 ft.

CADDO COUNTY

Abernathy & Brown's No. 2 Houston, Sec. 24-6-13w	S.D. 1,115 ft.

CHEROKEE COUNTY

La Piere et al's No. 1 Woods, C SE SE Sec. 27-17-21	S.D. 1,504 ft.

COAL COUNTY

Radial Oil Co.'s No. 1 McGraw, NE NW Sec. 2-1s-8	S.D. 1,450 ft.
Whitney et al's No. 1 Miller, SE NE Sec. 10-2-8	Show wtr. 1,155-60 ft.; drlg. 1,475 ft.

COMANCHE COUNTY

G. W. Stogner's No. 1 Doebel, C SW SW Sec. 3-3-9w	S.D. 1,450 ft.

CREEK COUNTY

R. F. Moore et al's No. 1 Gilliam, NE cor. SW NW, Sec. 17-17-8	Drlg. 1,420 ft.

CUSTER COUNTY

Miley Pet. Co.'s No. 1 Caldwell, NE Sec. 12-14-14w	Location.

GRADY COUNTY

Schoonmaker et al's No. 1 Station, NW cor. 35-4-6w	Rig.

GARFIELD COUNTY

E. L. Love et al's No. 1 White, SE cor. NW Sec. 9-24-6w	S.D. 5,850 ft.

GARVIN COUNTY

Malarnee et al's No. 1 Phillips, NE SW SE Sec. 24-2-2w	S.D. 4,830 ft.

GREER COUNTY

Dovell et al's No. 1 Capell, NW cor. Sec. 1-7-22w	5,000,000 ft. gas 1,455-65 ft.; T.D. 1,760 ft.
French's No. 1 Murphy, SW NW Sec. 23-7-21w	S.D. 1,645 ft.

(Continued on Page 129)

Little Change in Kansas Production

Extensions in Voshell and Wright Pools and Semiwildcat Completions Feature an Otherwise Dull Week in Field

By W. A. Spinney
Staff Correspondent, Kansas Fields

Crude oil production in Kansas averaged approximately 98,500 bbls. a day for the week ending March 26, which is a decrease of 700 bbls. a day compared to the previous week.

Simpson sand production was extended a half mile north in the Voshell Pool, in McPherson County, during the week. Slick, Pryor & Lockhart's No. 1 Stucky, SE cor. SW SW, Section 27-20-3w, started to show oil at 3,393 feet and at 3,425-42 feet the oil rose in the hole at the rate of 20 bbls. an hour. The well is to be given a swabbing test as soon as tankage can be erected. The well was formerly a chat gas well that was completed about three years ago with a potential of 9,000,000 feet of gas a day.

In the southwestern part of Ellsworth County, Derby Oil Co.'s No. 1 Stratman, in Section 12-17-10w, pumped 487 bbls. of oil in 12 hours and was given a potential of 974 bbls. a day.

It is the opinion of some that the outlet for the central western Kansas areas along the Barton-Ellsworth arch, in Stafford, Barton, Rice and Ellsworth Counties will be determined by pools and not the area as a whole. It is believed that purchasing companies will take more crude oil from separate pools and not from the area as a whole. The production from this area shows a decrease for the first 15 days in March compared to the February production. This is due to the White Eagle Oil Corp. in the Ritz-Canton area and the Stanolind Crude Oil Purchasing Co. in Holyrood district in Ellsworth County, both reducing their purchases necessitating a cut in the allowable in each district.

The Holyrood Field embraces the area in the southwestern part of Ellsworth County, and includes the Stoltenberg, Stratman and Heiken Pools. This area is believed to be the most active along the Barton-Ellsworth arch. There are eight tests drilling at the present time and several others proposed.

Shipments of crude oil from the Holyrood Field during the month of February totaled 30,687 bbls., an average of 1,058 bbls. per day. The crude oil is handled by the Stanolind Crude Oil Purchasing Co. which provides the only outlet from the field. The crude oil came from seven producing wells. The oil was shipped out in 148 tank cars. The pipe line shipments from the different pools was as follows: Heiken area, one well, 9,460 bbls.; Stoltenberg area, with two wells, 7,634 bbls.; and Stratman area, with four wells, 13,593 bbls.

A comparison of the average daily production of the central western pools in February with average daily production in the first 16 days in March is as follows:

Pool—	Feb.	16 days in Mar.
Ritz-Canton	12,895	11,204
Voshell	7,954	7,528
Schurr	1,833	1,901
Isern	190	258
Sharpe	159	127
Stratman	469	577
Stoltenberg	219	292
Heiken	326	149
Richardson	(*)	(*)
Total	24,043	22,036

*Shut in.

Up to the present time no action has been taken on the crude oil nominations by purchasers in the central western part of the State for the month of April. The allowable of the Rits-Canton Pool, was reduced from 10 per cent of the potential to 8 per cent.

Kansas oil fields continue inactive due to bad weather and from present indications only offset tests will be drilled until the oil market demands show an increase. The only exception is expected to be in several places along the Barton-Ellsworth arch that are due to be tested.

Magnolia Petroleum Co.'s No. 1 Boyer, SW cor. NW, Section 7-20-10w, in the Isern Pool, Rice County, found a hole full of water at a total depth of 3,432 feet. The top of the Siliceous lime was found at 3,322 feet and the first showing of water was at 3,375 feet. The well is located about a quarter of a mile due east of Hilligoss and others' discovery well in the Isern Pool, located along the Barton-Rice County line. Hilligoss and others' discovery well made 400 bbls. of oil in six hours from the Siliceous lime at 3,314-28 feet.

Wright Pool Extended

Production in the Wright Pool, near Valley Center in Sedgwick County was extended a quarter of a mile to the west and it indicates a revival of drilling operations in the area. Continental Oil Co. and others' No. 1 Corr, SE cor. NW, Section 12-26-1w, is estimated at 250 bbls. a day from the Viola lime at 3,335-39 feet. Oil rose to the top of the hole in eight hours.

The top of the producing formation in the well was found considerably higher than in more than 100 other wells in the Wright Pool, and it ordinarily would mean that an important extension has been found. But owing to the fact the field is almost four years old and has been on the pump for some time the water level is necessarily high.

Tanks were being erected at the location preparatory to a production test. If the well proves to be a steady producer it is expected to result in the drilling of a number of other tests on the west and southwest side of the Wright Pool. Little or no drilling has been in progress in the pool for almost two years.

The test was started on a short term lease and the Continental Oil Co. and Gypsy Oil Co. are drilling another test a half mile to the south of No. 1 Bishop, to test that acreage.

It was found the well was making about a half a bailer of water per hour and the owners were preparing to plug back the test from the total depth of 3,339 feet to 3,338 feet in an attempt to shut off the water. The top of the pay horizon in the well was found higher on structure than in any other well in the Wright Pool.

South of the Voshell Pool, in McPherson County, the Mid-Kansas Oil & Gas Co.'s No. 1 Sperling, NW cor. NE, Section 27-21-3w, is a new location.

In the State Line Pool, in Sumner County, Gypsy Oil Co.'s No. 1 Williams, NW cor. SE SW, Section 16-35-3w, just over the state line in Kansas, was drilled deeper to the Silicious lime at 4,969-5,076 feet, getting water. The well was drilled deeper from the Wilcox sand when it exhausted its production.

Extension Well in Greenwood

In Greenwood County Mathews and Rex's No. 1 in the NW cor. SE, Section 8-24-12, is a new location. It is a diagonal offset to the same operators' No. 1 Wilson, in the same section which is rated at 125 bbls. a day from the Bartlesville sand at 1,693-1,701 feet. The No. 1 Wilson extended production about a mile to the southeast.

Ritz-Canton Potential

The potential daily production of the Ritz-Canton-Decker Field in McPherson County, according to a recent gauge is 98,833 bbls., according to a report of the umpire, L. R. Pickrell, from 124 wells.

The potential of the 73 Viola lime wells was 81,618 bbls., while the 51 chat producing wells have a combined potential of 17,215 bbls. daily. The potential of the Viola lime wells increased from 70,784 bbls. on the previous test to 81,618 bbls., while the potential of the chat wells declined from 42,786 bbls. to 17,215 bbls. The previous potential gauge of the same field was 113,786 bbls. The present potential gauges were taken from February 25 to March 12, and were obtained by 12-hour pumping tests.

The field average per well is 790 bbls., while the average of the Viola lime wells is 1,117 bbls. and the average of the chat wells is 338 bbls.

The two largest wells owned by G. P. Dickey produce from chat. No. 1 Decker tested 3,675 bbls. a day and the No. 2 Decker, 3,194 bbls., while the Lario Oil & Gas Co.'s No. 2 Miller gauged 3,068 bbls.

The largest Viola lime well is Carey and others' No. 1 Holt, which gauged 1,862 bbls.

Cowley County

Roth & Faurot's No. 3 Moncrief, SE cor. SW NE Section 22-32-4, Lot 1, Block 26, Reynolds College View addition to city of Winfield, has been completed for 300 bbls. in Siliceous lime at 3,270-76 feet. McKnabb & Mission Oil Co.'s No. 1 Evans, Lot 2, Block 42, Highland Park addition to city of Winfield, NW cor. NE SW Section 22-32-4, made 100 bbls. in sand at 2,312-20 feet after plugging back from 3,329 feet in Siliceous lime.

Greenwood County

Central Petroleum Co. made location for No. 5 Sheets, NW cor. SE NE Section 23-22-11. Gore and others' No. 2 Smith, SE cor. SW NE Section 6-24-12, is dry and abandoned at 1,866 feet. Mathews & Rex's No. 1 Wilson, SE cor. NW Section 8-24-12, made 120 bbls. in sand at 1,693-1,701 feet, total depth 1,717 feet.

McPherson County

Derby Oil Co. and The Texas Company made location for No. 3 Unruh, NW cor. SE Section 26-19-2w, Ritz-Garrett-Decker area. Youker and others' No. 2 Eaton, SW cor. NE Section 26-19-2w, is a rig on the ground. Mid-Kansas Oil & Gas Co. made location for No. 1 Sperling, NW cor. NE Section 28-21-3w.

Sedgwick County

Continental Oil Co. and Gypsy Oil Co.'s No. 1 Roll, NW cor. NE Section

(Continued on Page 133)

WILDCAT OPERATIONS IN KANSAS

(Descriptions are East unless marked otherwise)

BARTON COUNTY

Company, farm and location— Remarks:
Morgan & Flynn's No. 1 Haas, NE SW, Sec. 30-18-15w.. Location abnd.
Skelton Oil Co.'s No. 1 Ott, C SE SE, Sec. 16-19-14w.... S.O. 3,225-28 ft.; 3,304-16 ft. wtr.; fishing 3,375 ft.

DICKINSON COUNTY

Severe et al's No. 1 Lavengood, NE SW Sec. 13-13-2..... S.D. 4,752 ft.

EDWARDS COUNTY

Mid-Kansas O. & G. Co.'s No. 1 Converse, SW NE NE Sec. 30-24-18w ..... R.O.G.

ELSWORTH COUNTY

R. Gear et al's No. 1 Sanberth, C SW SE Sec. 29-16-9w... S.D. 50 ft.
Alyward et al's No. 1 Stratman, SE NW SE, Sec. 1-17-10w ..... Siliceous 3,255-71 ft.; 117 bbls. 1 hrs. shut in; estimated 3,000 bbls.; no pipe line connections.
Aladin Pet.'s No. 1 Stoddenberg, C SW Sec. 22-16-10w.... Siliceous lime 3,332-47 ft.; estimated 1,500 bbls. a day; shut in.

FINNEY COUNTY

National Ref. Co.'s No. 1 Wells, C SW Sec. 13-23-30w... Drlg. 4,100 ft.

HARVEY COUNTY

D. R Louck's No. 1 Regier, SW SE NW Sec. 9-22-3w.... R.O.G.
J. Liggett et al's No. 1 Vessell, NE SW, Sec. 3-23-3w.. Location.
Liggett et al's No. 1 Davis, SW SE NE Sec. 7-24-1..... S.D. 2,500 ft.

KINGMAN COUNTY

Panhandle Drlg. Co.'s No. 1 Wetheral, C SE NW SW Sec. 26-28-10w ..... S.D. 890 ft.

McPHERSON COUNTY

Detrich et al's No. 1 Sinclair, SE SW, Sec. 25-19-1w.... Rig.
Shell Pet. Corp.'s No. 1 Johnson, SE SW SW Sec. 35-19-3w ..... Top chat 2,984-3,007 ft.; 13,500,000 ft. gas and 600 bbls. oil; completed.

MORTON COUNTY

Hydraulic Oil Co.'s No. 1 State Land, NW SE Sec. 32-34-43w ..... T.D. 3,640 ft.; temp. abnd.

MORRIS COUNTY

Kostle-Moseley & Hatfield's No. 1 Furney, NE SE Section 16-16-8 ..... Spud; S.D.
Urschel et al's No. 1 Bernuch, NW SE NW Sec. 10-17-7.. Fishing 915 ft.
Hankerson et al's No. 1 Cessman, SW SE Sec. 24-16-9... S.D. 2,625 ft.

NORTON COUNTY

Richards et al's No. 1 Colby, Sec. 17-4-21w..... Rig.

OSAGE COUNTY

Briggs & Smith's No. 1 Wood, SE NW Sec. 21-14-15..... S.O. 2,190-2,200 ft.; S.D.

PRATT COUNTY

Ninnescah O. & G. Co.'s No. 1 Hardesty, SW SE SE, Sec. 28-27-11w ..... Rig on ground.

RAWLINS COUNTY

J. G. Durham et al's No. 1 Weaver, SE cor. Sec. 3-2-35w.. S.D. 3,925 ft.

RENO COUNTY

Jarvis & Wright's No. 1 Rainbow, NW SE Sec. 33-22-7w.. Rig.

RICE COUNTY

J. Liggett et al's No. 1 Thodel, C NW NW, Sec. 11-21-7w. S.D. 50 ft.
Gypsy Oil Co.'s No. 1 Steckel, C NE NW, Sec. 31-19-10w. Set 3,299-3,324 ft; S.O.

RUSSELL COUNTY

J. Brennan's No. 1 Waly, CNL E½ NW Sec. 29-13-11w... Rig.
T. Palmer et al's No. 1 Pasek, C SE Sec. 3-14-11w..... Sil. 3,385-3,427 ft.; csg. trouble.

RUSH COUNTY

Skelton et al's No. 1 Brock-Hartman, SW SE NE Sec. 4-18-16w ..... S.D. 50 ft.

SALINE COUNTY

Twin Mounds Oil Co.'s No. 1 Wels, C W½ NE NW Sec. 20-13-4w ..... S.D. 2,710 ft.

SHERIDAN COUNTY

Flo et al's No. 1 Shoemaker, SE SW Sec. 27-7-26w..... Drlg. 4,248 ft.

STEVENS COUNTY

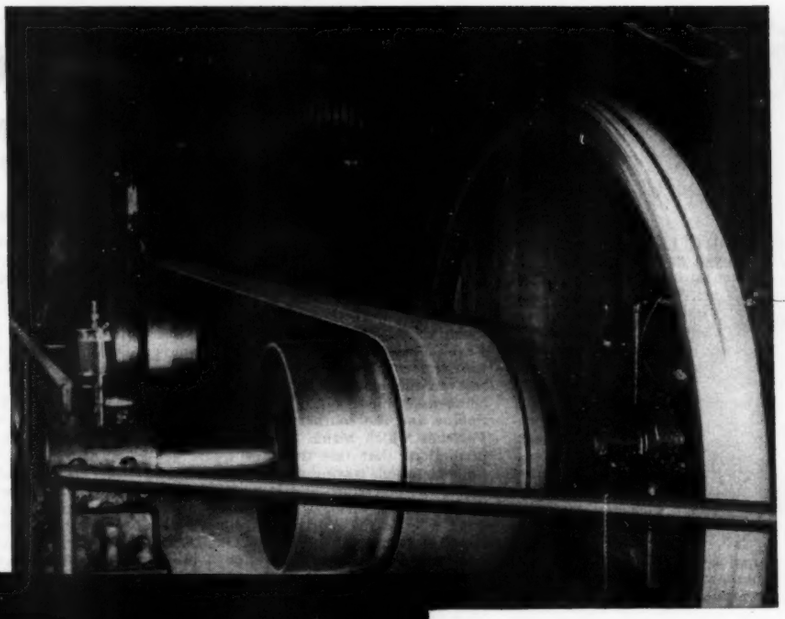
Argus Prod.'s No. 2 Christopher, C NE Sec. 10-33-39w.... S.D. 5,521 ft.

SUMNER COUNTY

Trees Oil Co. and Shell's No. 1 Springate, NE SE SW Sec. 6-34-2 ..... Drlg. 2,291 ft.

WASHINGTON COUNTY

Sincox et al's No. 1 Penwell, NW SE NE Sec. 16-3-3.... S.D. 1,720 ft.



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The belt is a short-type installation, 12 in. wide and 44 ft. 6 in. long, operating from the gas engine pulley to an O. C. S. countershaft. The well is 4633 feet deep.

The continuous performance ability exhibited by this Goodyear transmission belt is the uniformly greater ability built into Goodyear COMPASS Cord Belts. One of the comparatively recent Goodyear Belt developments, COMPASS Cord Oil Well Belt, double, brings special construction qualities to the job.

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North Louisiana Sees Renewed Activity

Cessation of Prolonged Rain and Floods Marked by New Wildcat Developments and Increased Drilling in Productive Areas

By J. R. Crumpton
Staff Correspondent, Louisiana-Arkansas

SHREVEPORT, La., Mar. 28.—The result of fair and dry weather throughout this division during the last few weeks is reflected in the number of new wildcat developments started and also in the increase in drilling operations in productive and near-productive areas. For several months excessive rainfall, with the resultant flooded streams, hindered the moving in of rigs to outlying locations and caused a shutdown of wells already drilling. High water also caused a decline in the daily runs of crude from some of the fields, particularly Smackover heavy grade in Union County, Arkansas, and in some of the producing areas of Caddo Parish.

Activities started during the last week are practically all in North Louisiana and the border counties of East Texas. In Grant Parish, the Security Petroleum Corp. has assembled a good block and derrick is built for its No. 1 Swope estate in Section 16-9-1e. It is reported that the venture is backed by New Orleans capital. Grant Parish is in the north central part of the state, between the Urania Field in La Salle Parish and the Zwolle Field in Sabine Parish. The belief exists with many operators that one or more fields will be uncovered in the north central tier of Louisiana in which are the parishes of Vernon, Grant and Rapides.

In Sabine Parish, 2 miles north of the Blue Lake Field, the original producing field of this area, Broderick & Calvert have assembled 900 acres centering around Sections 1 and 2, Township 7, Range 14. A derrick has been erected for their first test, No. 1 Costello, Section 2-7-14. The wildcat is 6 miles west of the nearest production in the western extremity of the Zwolle Field.

The Texas Company Leasing

South of Pleasant Hill, in northern Sabine Parish, The Texas Company has leased around 700 acres, paying $2 per acre for five-year commercial leases. The acreage adjoins on the north the 4,200-acre block of Frank Foster, Inc., on which a small flowing well and a good gasser have been completed. It was the original intention of The Texas Company to block several thousand acres in this vicinity, but the developments in the Frank Foster well caused the landowners to ask for a consideration other than a test on the block. The other blocks are being assembled in the northern part of Sabine and the southern part of DeSoto Parishes which seems to confirm recent predictions that this territory would get some thorough testing this year. Between the towns of Oxford and Pelican, DeSoto Parish, J. M. Bridges is blocking up a large tract in the southern part of Township 11, Range 12. Smith & Hughes of El Dorado, Ark., are assembling a block centering around the southeast corner of Section 28-9-12, Sabine Parish. More than 3,000 acres has been leased to date by these operators, most of which is from lumber companies with large holdings.

A wildcat in the northern part of Webster Parish that will be closely watched is J. K. Wadley's No. 1 Matthews, Section 11-23-9. The test is about 5 miles west of the farthest westward production of the Haynesville Field extending over into Webster Parish. It is 200 feet south of the Red Hawk Oil Co.'s No. 1 Matthews, which was junked and abandoned in May of last year at 2,797 feet. The Matthews well developed a small show of oil on a test but was junked after the 6-inch casing collapsed with the fluid bailed down to only 2,400 feet. The Pyramid Oil & Gas Co. is rigging up to drill its No. 2 Breard, Section 9-18-16, in the Greenwood gas area of western Caddo Parish.

Three Tests in Shelby County

Four of the bordering East Texas Counties reported new operations during the past week with Shelby County taking the lead with three new tests. The activity in this county is over on the eastern border near the Oil News' No. 1 Pickering Lumber Co., which recently encountered a good showing of oil around the 1,500-foot level. A good quantity of oil has been swabbed from the wildcat since drilling the plug several weeks ago, and it is being rigged up to pump. About 1 mile southeast of the Oil News test, Fuller and O'Brien Brothers, Shreveport operators, are rigging up to drill their No. 1 Frost-Johnson Lumber Co., Aaron Castelberry Survey, Sedberry and others have made location for another test in this vicinity, No. 1 Pickering Lumber Co. in the Jane Stoddard Survey. Wray & Dunbar are rigging up their No. 1 C. A. Hayden, D. T. F. Yordt Survey. Dick Sebastian of Shreveport has assembled a block south and east of the Oil News well and will drill a test well as soon as water recedes from the acreage.

In Harrison County, an area experiencing many dry holes since the discovery of the East Texas Field, Gochee and others have staked a location for their No. 1 T. W. Davidson, R. W. Starr Survey. The wildcat is 5½ miles northwest of the town of Hazelton, in the northwestern part of the county, near the Marion County line. The United Production Co. has started another test to the Trinity gas horizon in the Bethany Field of Panola County. Its No. 12 Werner, B. C. Jordan Survey, set 15½-inch surface casing at 150 feet, 10½-inch subsurface at 1,200 feet and is drilling at 2,710 feet. The gas pay from the Oolitic lime of the Trinity is encountered in this area around 4,700 feet. In Cass County, William S. King is drilling at 1,240 feet on his No. 1 T. R. Richey, Lavinia Mornen Survey. This same operator abandoned his No. 1 McDonald, Martha Ingram Survey, about 1 mile from the present test, because of a crooked hole at 2,265 feet.

Four Completed Wells

There were only four completed wells reported for the division during the past week, resulting in two oil wells from the Zwolle Field and two gassers from the Jackson Field in Mississippi. In Zwolle, L. F. Bahan's No. 1 Quayhaglen, Section 11-7-11, in the eastern extension, was completed as a 100-bbl. producer from 2,585 feet. The Southland Drilling Co.'s No. 1 Mansfield, Hardwood Lumber Co., Section 36-8-13, is pumping 185 bbls. daily from 2,403 feet. This well is west of the Zwolle townsite production, and an offset to the north of the first production brought in in the western extension in Section 1-7-13.

The Jackson gas field maintained its consistency by reporting two good wells. In the Hinds County area Ferguson-Fuller and others' No. 1 Cruse, Section 34-6n-1e, gauged 44,000,000 feet from a total depth of 2,465 feet. On the east side of Pearl River in Rankin County, Meredith and others completed their No. 1 Strawder, Section 12-5n-1e, with an initial flow of 38,000,000 feet of gas from 2,384 feet. Two other wells in the field are practically completed but are experiencing some trouble. The Love Petroleum Co.'s No. 1 Interior Lumber Co., Section 2-5n-1e, Hinds County, blew in with an estimated flow of 17,000,000 feet but developed a leaky casing, and the operators are arranging to set a string of 5⅞-inch inside of the 6⅝-inch. James Alexander, trustee, has recovered all except six joints of drillstem and bit from his No. 1 Ridgeway & McGehee, Section 1-5n-1e, Ranklin County. This well blew in wild two weeks ago with an estimated 35,000,000 feet of gas as the crew was coming out of the hole after drilling plug.

Two Important Wildcats

Two important wildcats in North Louisiana are to be tested during the coming week. R. L. Gay, trustee, will drill plug from casing set at 4,725 feet in his No. 1-A Long Bell Lumber Co., Section 10-8-13. The test will be made from Oolitic lime at a total depth of 4,772 feet. In the northern part of Sabine Parish, Frank Foster, Inc., has set 6⅝-inch in No. 1 Stevens, Section 20-9-11, and will test from 3,358 feet. This test blew in wild a few weeks ago, making an estimated 20,000,000 feet of gas, but had a small spray of salt water coming from the open hole. It is believed that this salt water is coming from the Blossom sand above, and since the casing has been set below this stratum, the final test will disclose whether or not this is true. The Washita, from which the gas is coming, does not carry any great amount of salt water in this area, but the territory would look much better if developments prove that the salt water is coming from above instead of the bottom of the hole.

Two tests in Union County, Arkansas, are nearing the pay horizon and will test in the next few days. In the Urbana Field, Wilson & Chapman's No. 1 K. D. Parker, Section 3-18-13, is coring sand at 3,567 feet, with the top of the formation encountered at 3,563 feet. The wells in this area have been paying off from a good sand thickness slightly below the 3,600-foot level. The Drillers Oil & Development Co.'s No. 1 Haynie, Section 1-17-16, topped the Nacatoch at 2,135 feet and is coring in the sand at 2,138

(Continued on Page 133)

WILDCAT OPERATIONS IN LOUISIANA-ARKANSAS

(Rotary operations unless otherwise designated)

NORTH LOUISIANA
AVOYELLES PARISH

Company, farm and location— Remarks:
Stauffer & Eshleman's No. 1 Caruth, Sec. 40-1n-7e .....Derrick.

BOSSIER PARISH

Dr. W. N. Hankin's No. 1 Newell, 300 ft. S and W, NE cor., Sec. 12-19-11 .....S.D. 1,890 ft.
Triangle Drlg. Co.'s No. 1 Nuckolls, Sec. 7-22-12, 1,985 ft. W, 1,980 ft. S, NE cor. .....S.W. and abd. 2,804 ft.

CADDO PARISH

Calatex O. & G. Co.'s No. 1 W. B. Hudson, Sec. 8-16-16, 2,640 ft. E, 2,865 ft. NW cor., Sec. .....S.D. 2,800 ft.
Louana O. & G. Co.'s No. 1 Hammock, Sec. 32-19-6, 660 ft. N and W, SE cor. .....Coring 2,701 ft.
Pyramid O. & G. Co.'s No. 2 Breard, Sec. 9-8-16, 660 ft. S, 1,980 ft. W, NE cor. Sec. .....Derrick.

CALDWELL PARISH

Carter Bell's No. 1 Taylor, 150 ft. S, 150 ft. E, NW cor. NE SE, Sec. 17-14-4 .....Drlg. 1,500 ft.
Hudson et al's No. 1 Burton, Sec. 35-12-2e .....S.D. 2,950 ft.

CATAHOULA PARISH

National Drlg. Co.'s No. 1 Marsh McMiller, 70 ft. N, 100 ft. W, C, Sec. 26-9-6 .....T.A. 3,097 ft.

DE SOTO PARISH

E. T. Oakes' No. 1 R. H. Bryant et al, 200 ft. N and W, SE cor. NE NW, Sec. 30-13-15 .....Coring 3,370 ft.
A. R. Smith's No. 1 Horn, Sec. 16-12-15, NE cor. Sec. .....Rigged up and S.D.
DeSoto Development Co.'s No. 1 Nickey, Sec. 7-13-12 .....Derrick.
Walters-Nicholson, tr.'s No. 1 Jim Guy, Sec. 3-11-13 .....Arranging to test 1,675 ft. (corrected).

GRANT PARISH

Security Pet. Corp.'s No. 1 Swope est., Sec. 16-9-1e, 1,698 ft. N, 220 ft. E, SW cor. Sec. .....Derrick.

(Continued on Page 124)

LOUISIANA-ARKANSAS PROVEN AREAS

NORTH LOUISIANA
CADDO PARISH—PINE ISLAND

Company, farm and location— Remarks:
Simplex Oil Co.'s No. 1 Youree-Glassell, 500 ft. N and E, C, Sec. 13-20-15 .....S.D. 2,275 ft.

OUACHITA PARISH

Carbon Cons.' No. 7 Guthrie, Sec. 50-20n-4e, 5,263 ft. N, 7,475 ft. W of cors. of Secs. 25, 26 and 49, in Sec. 50 .....Location.

SABINE PARISH—ZWOLLE

L. F. Bahan's No. 1 Quayhagle, Sec. 11-7-11, 250 ft. N, 330 ft. W, SE cor. Sec. .....Completed for 100 bbls. 2,585 ft.
O. J. Baird's No. 2 Duggan, Sec. 14-7-11, 200 ft. S and E from cen. Sec. .....Location.
Coates Pet. Co.'s No. 2 McNeely, Sec. 14-7-11, 250 ft. S and W, NE cor. NW NE .....Derrick.
Hawkins & Antoon's No. 1 Newton, Sec. 1-7-11 .....W.O.S.R. 2,609 ft.
Hudson & Bird's No. 1 Walden, 480 ft. N, 300 ft. E, SW cor. SW NE, Sec. 26-8-11 .....S.D. 2,454 ft.
Zeke Lohman's No. 1 McCormick, 660 ft. E, 330 ft. N, SW cor. NE SW, Sec. 2-7-11 .....S.D. 2,450 ft.
Loring Oil Co.'s No. 18 Bowman-Hicks, 1,280 ft. S, 275 ft. E, NW cor. SW NW, Sec. 15-7-12 .....Coring 4,806 ft.
Ben Merritt, tr.'s No. 2 Byrd, Sec. 1-7-11 .....S.D; W.O. 2,579 ft.
Pelican Nat. Gas Co.'s No. 11 La. Long Leaf Lbr. Co., Sec. 10-7-11, 330 ft. N and W, SE cor. NE NW .....W.O.S.R. 2,592 ft.
Ohio Oil Co.'s No. 9 Bowman-Hicks, Sec. 35-8-12, 250 ft. N, 330 ft. E. SW cor. NW SE .....Set 6-in. 2,322 ft.
Sabine Prod. Co.'s No. 3 Pearce, Sec. 10-7-11, 330 ft. S and E, NW cor. SE NW .....Rigging up.
Stovall Drlg. Co.'s No. 3 Nulton, 330 ft. N and W, SE cor. SE NE, Sec. 2-7-13 .....Location.

UNION PARISH

Southern Carbon Co.'s No. 58 fee, Sec. 17-20-4e, 1,557 ft. W, 1,220 ft. S, NE cor. Sec. .....Set 12½-in. 173 ft; drlg. 245 ft.

(Continued on Page 124)

Flank Production at East Hackberry

Opens New Horizon and Second Extension in Ten Days. Rabbs Ridge and Montgomery County Deals Create Better Feeling

By Neil Williams
Staff Correspondent, Gulf Coast Fields

HOUSTON, Tex., Mar. 28. — Recent trades on the Gulf Coast together with announced crude advances in other areas to be effective April 1 and expected advances on the Coast have served to create a generally better feeling in the oil situation among operators here. New interest has been placed on certain districts and the next few months are expected to witness the start of development programs of importance.

Field developments on the Gulf Coast the past week were marked by the discovery of flank sand production on the northwest flank of the East Hackberry Dome, Cameron Parish, Louisiana, which not only opened a new horizon in virgin territory there but also gave the field its second extension within 10 days. This extension was in Union Sulphur Co.'s No. 1 Gulf Land (Humble lease), 284 feet north and 30 feet west out of the SE cor., Section 11-12s-10w, which was completed Friday, flowing 1,400 bbls. of pipe line oil daily from a sand 5,990-6,001 feet. Production was through a three-eighths-inch choke with a pressure of 900 pounds. Gravity of the oil was 34.3 degrees corrected.

The largest of the trades mentioned was the purchase by Humble Oil & Refining Co. of Cullen & West's half interest in the Rabbs Ridge (Thompson) Field of eastern Fort Bend County. Although negotiations had been under way for some time confirmation of the actual completion of the purchase was not given until last week. Terms of the deal, as reported, were on the basis of $3,000,000 in cash with $17,000,000 additional to be paid by Humble out of a quarter of the first oil produced with a small overriding royalty thereafter. Nearly 6,000 acres is involved.

The other half interest in the field is held by Gulf Production Co. Humble Oil & Refining Co. already has taken over the operation in the field formerly done by Cullen & West. It is expected that development will be carried on with a view toward repressuring as was done in Humble's Sugarland Field, which is located only a few miles to the north of Rabbs Ridge.

New Importance for Rabbs Ridge

The purchase by Humble places a new value on the importance of Rabbs Ridge. The field, however, has been recognized as being potentially one of the most prolific on the coast. It was opened June, 1931, and to date 11 wells, two by Gulf Production Co., have been drilled and completed as producers and a productive area over 1½ miles from north to south already has been proved. The main production is from a 5,200-foot Oligocene sand which has been topped at an almost uniform depth throughout the extent of the field. A number of shallower sands in the Miocene have been encountered, the discovery well itself having been completed in a sand at 3,087 feet, but these sands have not proved of importance and for the most part they have been passed up lately. The field is unusual for most coastal fields in that it has an abundance of gas and pressure. Production of the field at present is a little more than 8,000 bbls. daily although the output has been as much as 12,000 bbls. Pipe line capacity restrictions have limited daily runs to a maximum of 9,000 bbls.

Although the Rabbs Ridge purchase involved a larger consideration, Humble Oil & Refining Co.'s recent trade with Strake Oil Corp. for the latter's South Texas Development Co.'s holdings in the Conroe district of Montgomery County may be of more far reaching importance from a development and wildcatting standpoint. The transaction provides for the development of the property, and actual purchase of it by Humble if results of the drilling program scheduled are satisfactory.

As previously reported the deal calls for the payment of $500,000 in cash, $100,000 immediately and the remainder in deferred payments to be made during the period of exploration, in which six and possibly eight tests are to be drilled alternately by the Strake Oil Corp. and Humble Oil & Refining Co. Upon proving up the block by these tests, purchase of the property will be completed by Humble, which company will pay $3,500,000 out of the first quarter of the oil produced, and carry on operations. The purchase affects a total of 4,368 acres which comprises most of the South Texas Development Co. land centering in the Theodore Slade Survey. The Strake Oil Corp. retains more than 3,000 acres.

Wildcatting Play Expected

This transaction is expected to pave the way for an extensive wildcatting play to extend through Montgomery County along the trend of the Strake block, as is evidenced by the renewed interest displayed the past week in leasing there and by the turning of several blocks with drilling obligations. Although the Strake discovery well, No. 1 South Texas Development Co., has been in since last December and has been producing steadily and has been looked upon as the forerunner of a probable important field, the majors until now have remained indifferent outwardly to it and as there has been no additional development, considerable uncertainty has hung over the area with the result that leasing activity by independents has been hanging fire.

The Strake well is the first producer in the county, which is one of a group of counties in entirely virgin territory lying just north of the salt dome area and between the latter and the East Texas Field. Consequently little is known geologically of the area and activity has been held up pending further development to determine the type structure, trends and possible extent. The discovery well is at a total depth of 4,991 feet and is believed to be in either the Dibollensis zone of the Jackson or the upper Yequa, the same sand which is producing in the Pettus Field in Southwest Texas. It came in making an estimated 14,000,000 feet of wet gas and has been flowing better than 100 bbls. of 56 gravity oil daily.

Although this is the first important trading in the immediate Conroe district, Humble and other larger companies, however, have been acquiring considerable acreage in scattered large blocks extending along the same trend through southern San Jacinto County, which adjoins Montgomery County to the east, and also have obtained acreage in the extreme eastern part of Montgomery County along the line.

Watching Heep Well

At present the outcome of the Heep Oil Corp.'s No. 1 Cartright, 1¼ miles northeast of the Strake well, and the first test started since the latter was completed last December, is being awaited with considerable interest. Little definite information is available as to how this test is running in respect to the Strake well. Early the past week a drill stem test was made of a sand which made 23 thribles of salt water. Operators are not giving out the depths and formations and the sand has been reported variously as being from 4,180 feet to below 4,300 feet deep.

In Jackson County, The Texas Company has recently completed the blocking of approximately 7,000 acres centering in the Stephen F. Austin Survey at the town of Lolita. The block is of particular interest in view of its relationship to the Keeran ranch just to the southwest in Victoria County on which a wildcat well was completed early in January by Bunte and associates. That well was on a 2,500-acre block, originally a part of a 5,000-acre block held by the Gulf Production Co. The Texas Company took a straight five-year commercial lease paying $2.50 an acre.

The latter company also completed another important trade in the McFaddin district of southwestern Victoria County by acquiring the Gray Survey of 678 acres, paying approximately $100 an acre cash and an additional $200 an acre to come out of oil. The survey had been held out from all the companies in previous blocking and is a narrow strip located between The Texas Company's McFaddin block and Humble Oil & Refining Co.'s O'Connor block across the line in northern Refugio County, and on each of which blocks there is a wildcat producing well.

East Hackberry Extension

In field operations, the East Hackberry extension to the northwest flank of the dome, as previously mentioned, was the most important development. Flank production until now has been only along the south side of the dome, confined to a narrow strip of wells producing from sands from 3,900 to 4,200 feet. However, other flanks of the dome have been undrilled, Union Sulphur Co.'s No. 1 Gulf Land (Humble lease), the new well, and the same company's No. 1 Gulf Land (Pure lease), now drilling, being the first tests on other sides. The latter is in the same vicinity as the Humble lease well, being 1,148 feet north and 374 feet west of it. It now is drilling below 4,800 feet. It is further out from the dome than the new producer.

This is the second week in succession that East Hackberry has figured in development news, a new pool, the third, on top the dome having been opened the preceding week by the completion of Calcasieu Oil Co.'s No. 1 Unsurveyed Island, which flowed better than 2,200 bbls. daily from lime rock at a total depth of 2,865 feet. Whether the lime rock in this is the cap rock or a false cap has not been determined but if the former it establishes the first cap rock production at East Hackberry and one of the few cap rock pools to be opened within recent years. The other two pools on top the East Hackberry Dome are in shallow sands overlying the cap.

Other completions during the week included McAlbert Oil Co.'s No. 5 Wilburn, east side of Barbers Hill, flowing 680 bbls., pipe line oil, 4,321 feet; Humble Oil & Refining Co.'s No. 1 Hooks, south flank of Pierce Junction, flowing 99 bbls. in 20 hours, 3,805 feet; Sun Oil Co.'s No. 50 River, Humble shallow field, flowing 50 bbls., 1,396 feet; Rio Bravo Oil Co.'s No. 131-A "B," Saratoga, pumping 10 bbls., 513 feet; Republic Production Co.'s No. 145 Dolbear, Hull, flowing 800 bbls., 2,483 feet; Gulf Production Co.'s No. 13 Briggs (workover), Goose Creek, pumping 5 bbls. net oil, 3,538 feet.

Markham Dome

One of the most interesting tests under way for some time is being drilled by Claude Hamill and associates on the extreme northeast side of the Markham Dome. This test, No. 1 Northern Irrigation Co., 50 feet out of the SW cor. N half NW, Section 5, Block 9, I.&G.N. Survey, is in strictly wildcat territory, slightly less than 2,000 feet north of production on the northeast flank and over three-quarters of a mile from the original Markham Field. This test at latest report was drilling below 1,850 feet in gumbo. Smith and associates' No. 2 Hudson, south side of Markham, has encountered a sand showing oil at 3,238-50 feet and is running casing to test. United North & South Oil Co.'s No. 1 McDonald, 800-foot extension test for the northeast flank pool, has recemented hole to test sand at 3,777-81 feet.

Manvel

At Manvel, Brazoria County, The Texas Company is pulling screen in its No. 2 Belcher, completed early this month as the second well in that field. The well, located 1,800 feet to the east and south of the discovery well, went largely to water, and was killed. It will be deepened from its present level at 5,602 feet

GULF COAST FIELDS AND WILDCATS

Week Ending March 26

DAMON MOUND—BRAZORIA COUNTY

Company, farm and location—	Remarks:
Intercoastal Oil Co.'s No. 9 Wisdom, S 45 deg. 312 ft. from NE cor. Lot C, Blk. 62, A. Darst Sur., and thence S 45 deg. 325 ft. in Lot A	Drlg. shale 2,006 ft.
The Texas Company's No. 2 Cave, 165 ft. NE and 55 ft. N, 45 deg. W from S cor. Lot B, Blk. 73, Wisdom Subd., A. Darst Sur.	Drlg. sticky shale 3,911 ft.

BARBERS HILL—CHAMBERS COUNTY

Bashara Oil Co.'s No. 2 Tarbutton, Henry Griffith League, 25 ft. W of Texas Gulf Producing Co.'s No. 2 Tarbutton	Set 30 ft. of 7-in. screen 3,634 ft.; swabbing oil and water through 2½-in. tubing.
R. E. Ferrell's No. 2 Wilburn, Henry Griffith League, 215 ft. W of No. 1 in center of 45-acre tract	Waiting cement to set 1,870 ft.
Gulf Prod. Co.'s No. 7 Wilburn, Henry Griffith League, 177 ft. W of No. 6	Cored sand and shale showing oil 4,347 ft.
McAlbert Oil Co.'s No. 2-B Higgins, Wm. Hodges Sur., 265 ft. from N line and 50 ft. from W line of tract	Derrick.
McAlbert Oil Co.'s No. 5 Wilburn, Henry Griffith League, 375 ft. of No. 4	Set 22 ft. of 5 5/16-in. screen 4,321 ft. and 2½-in. tubing; comp. flowing 680 bbls., 190 lbs. pressure, ⅝-in. choke.
Mills Bennett Prod. Co.'s No. 1-B Gulf fee, Wm. Bloodgood Sur., 500 ft. E and 50 ft. N of SW cor. of "B" lease	Drlg. salt 1,781 ft.; top of salt 1,706 ft.
Mills Bennett Prod. Co.'s No. 2 J. C. Means, Henry Griffith Sur., 300 ft. W of No. 2 in center of strip	Drlg. rock 1,314 ft.
Rio Bravo Oil Co.'s No. 3 Fisher, Wm. Bloodgood Sur., 300 ft. E and 33 ft. S of NW cor. of tract	Rigging up.

(Continued on Page 126)

Gain in Southwest Texas Operations

Some in Starr County, Others in Northern Duval County and the Balcones Fault Zone. Live Oak County Well Tests Oil

By B. D. Stevenson
Staff Correspondent, Southwest Texas Fields

SAN ANTONIO, Tex., Mar. 28.—A very noticeable increase in the number of operators coming to Southwest Texas with information that many more have made appropriations for operating in this territory, quite a little new lease activity, and a half dozen tests in wildcat territory waiting to test with more or less good showings is the feature over the week end. More than a dozen new operators within the past few weeks have taken offices at San Antonio, Laredo, Corpus Christi and Beeville, or have taken up their residence in these places, and the list of these new names appearing in the lists of "first reports" coming in each week indicates they are starting in to operate. The operations are scattered. Quite a few are in the Los Olmos district in Starr County, but northern Duval County is getting several and the Balcones Fault zone some. Others are scattered here and there.

Francis P. Hynes of Tulsa, in association with Nessly, is starting a test in northern Duval County. Salisbury Oil & Gas Co. has leased 3,000 acres in Guadalupe County, east of Seguin a few miles.

In many instances operators are taking up programs that were made back in 1929 and 1930, but were interrupted by the depression and the East Texas situation.

Not one of the half dozen or more wildcats over Southwest Texas that was in sand with more or less important showings and threatening new production was tested the past week with the exception of Phillips Petroleum Co. and Henderson Coquat's No. 2 Sanger in southwestern Live Oak County. It had a sand at 2,461-72 feet and early last week it tested 30 feet of oil and 470 feet of water and resumed drilling. It later found two more sands, both water sands, one at 2,891-2,900 feet and one at 2,927-34 feet, and is drilling ahead.

Other tests reported last week and still not tested are as follows:

L. W. Connor's No. 1 Holbien, in sand from 1,805-46 feet and showing gas and with casing set. It has been delayed by title matters but this has been cleared up and it was expected to test over the week end. It is in wildcat territory 3½ miles east of the Henne, Winch & Fariss Pool in northwestern Jim Wells County, in Block 7, Section 7, of the Holbien subdivision of the Las Animas grant. It looks like a gas well.

Magnolia Petroleum Co.'s No. 1 Seeligson in southern Jim Wells County, which attempted a drill stem test of sand at 4,927-33 feet, was still waiting at last reports for new drill pipe. The sand carried an odor of oil.

Houston Oil Co.'s No. 1 McGregor, a mile north of production in the Saxet Field, is still waiting on cement to set at 4,260 feet with total depth 4,265 feet. It had 45 feet of oil and 90 feet of mud on a short time drill stem test. The test is a mile north of nearest production, but the nearest production is at 4,550 feet in three wells close together. The only other production corresponding to the depth of No. 1 McGregor is in three wells on the Dunn lease 3 miles east.

G. B. Peterman's No. 1 Galler in Williamson County had not tested at last reports. It is 3 feet in Edwards topped at 1,490 feet, with a showing of oil. Heard & Heard's (R. E. Johnson) No. 1 Goodrich, a mile north of Rio Grande City in Starr County, with casing set at 1,380 feet and a showing of oil, was still tied up with title matters and no date set for a test. It is one of the most watched tests in Southwest Texas.

Amsden-Ingersoll-Miller's No. 1 Strumberg at 810 feet in western Bexar County is shut down with a showing of oil and may not test for some days.

Joe Bruner's No. 1 Malone in Caldwell County, at the south end of the Bruner (Salt Flats) Field, topped the Edwards at 2,788 feet and found it dry as to both water and oil. It may be drilled a little deeper. It made a little oil in both the chalk and Georgetown.

Pettus District

United Production Co. after some months of inactivity in the Pettus district has made two new locations. One is No. 40 Ray in about the center of the Thomas Hanson Survey and a few hundred feet north and east of nearest production. The other is No. 41 Ray, about half way between the townsite pool on the west and the Ray-McKinney Pool on the east and 660 feet from No. 31 Ray and No. 33 Ray, two producers drilled in that area that demonstrated that the two pools are one.

The west end of the Pettus extension is now devoid of tests drilling and with no announced plans. The only other activity is two tests by Henderson Coquat more or less experimental and slightly wildcat. Coquat has taken over Mauldin's No. 2 fee and the new location is 647 feet north of the south line of the George A. Kerr Survey and 150 feet east of Medio Creek which brings it a little less than 1,000 feet northeast of Houston Oil Co.'s No. 4 Portis, which is a dry hole. His other test in association with Barnsdall Oil Co. is about half way between the Cosden Pool on the north with production at 3,650 feet and the Pettus west extension on the south with production at 3,900 feet.

WILDCAT OPERATIONS IN SOUTHWEST TEXAS

Week Ending March 19

ATASCOSA COUNTY

Company, farm and location—Remarks:

American Central Oil Co.'s No. 2 Mary McConnell, 150 ft. W of E line, 300 ft. S of No. 1, Blk. 138, W. C. M. Baker Sur., 3 miles W and 6 miles S from Somerset..T.D. 1,660 ft.; standing.
Glen Mathis' No. 2 Mrs. C. Martin, 100 ft. SE of No. 1...T.D. 2,980 ft.; preparing to resume.

BLANCO COUNTY

Hardy-Sitton's No. 1 McMillan .....T.D. 602 ft.; S.D.
Theo. Hick's No. 1 Specht, 1,500 ft. from S line, 500 ft. from W line of farm, in Thomas M. Fowler Sur. No. 27 in extreme south point of county .....T.D. 1,650 ft.; abnd.
Liles Adams et al's No. 1 Luders, 150 ft. to S line, 1,420 ft. to E line of James Stanford's No. 155 .....T.D. 1,100 ft.; standing.

BASTROP COUNTY

E. R. Marts and W. J. Beavens' No. 1 R. L. Carter, 450 ft. from NE line, 150 ft. from NW line of 100-ac. tract in George J. Glasscock Sur. .....Spudded in.
Sun Oil Co.-Humble Oil & Ref. Co.'s No. 1 Powers, 400 ft. of N and E lines of Blk. 197, Bastrop town tracts..T.D. 4,039 ft.; drlg.

BEE COUNTY

Alexander et al's No. 1 McFall, 3 miles S Skidmore .....T.D. 2,100 ft.; standing.
Humble O. & R. Co.'s No. 1 Laura Thompson, 6,360 ft. from N line, 15,100 ft. from W line of tract in Garrett Roache Sur., S part of county .....T.D. 5,310 ft.; S.D.

BELL COUNTY

J. W. Riley's No. 1 W. S. Chaffin, in M. Griffin Sur. ....T.D. 450 ft.; S.D.
Jas. Scroggins' No. 2 Warrick, Ingram Sur. .....T.D. 1,432 ft.; fishing.

BEXAR COUNTY

Amsden-Ingersoll-Miller's No. 1 Strumberg, 450 ft. to W line, 1,020 ft. to N line of tract, 12 miles SW of San Antonio .....T.D. 810 ft.; S.D.
Eckert et al's No. 1 Edwards, 150 ft. to N and W lines of farm in Martinez Sur. .....T.D. 1,490 ft.; standing.
Callahan Final Oil Co.'s No. 1 B. H. Buck, 900 ft. to E line, 3,200 ft. to S line of farm, in J. M. McGamley Sur. .....T.D. 650 ft.; S.D.
Dr. Ewell Neil's No. 1 J. Watson, 500 ft. from W line, 1,700 ft. from S line of B. Martinez Sur. .....T.D. 2,495 ft.; in Edwards, dry.
Jones & Voltz' No. 6 Bonkowsky .....T.D. 650 ft.; drlg.
Schneider, Rees et al's No. 2 Claussen, 12 miles NE of San Antonio .....T.D. 1,330 ft.; S.D.
S. W. Blount's No. 1 S. A. Land Co., I. Perez Sur., 1,000 ft. to N line, 450 ft. to W line of tract .....T.D. 520 ft.; S.D.

CALDWELL COUNTY

Cole & Moseley's No. 1 Pierce, 150 ft. to NW and SW lines of tract, Solomon Seal Sur. .....T.D. 1,300 ft.; drlg.
Kistler, Stivers & Hendrick's No. 1 D. Carter, 400 ft. from NW line of Sur., 300 ft. NE or Creek in L. Allen Sur. .....T.D. 1,485 ft; standing in chalk.
Meyer's No. 1 G. C. and W. Walker, Solomon Seal Sur....T.D. 160 ft.; standing.
C. J. Webster Oil & Gas Co.'s No. 1 McCrory in John Neil Sur. .....T.D. 250 ft.; drlg.

DUVAL COUNTY

John F. Camp's No. 1 Well, 990 ft. NW and 150 ft. NE of cen. of Sur. No. 570 .....T.D. 200 ft.; set surface csg.
Frank Gravis et al's No. 2 Schallert, 425 ft. to E line, 150 ft. to S line of Blk. 10, Cain & Smith Subd. "A", Sur. No. 255 .....T.D. 1,610 ft.; standing.
Hynes and Nessly's No. 1 Duval Ranch Co., 200 ft. from S and E lines of Blk. 26, Sur. No. 196 .....Location.
O. W. Killam's No. 1 Peters, 150 ft. from E line, 450 ft. from N line of SE of Sur. No. 1 .....T.D. 2,725 ft.; standing.
Seacord and Putnam's No. 1 J. W. Johnson, 150 ft. to S and W lines of NW NW, Sur. 44 .....T.D. 425 ft.; drlg.

(Continued on Page 129)

SOUTHWEST TEXAS PROVEN AREAS

Week Ending March 19

COSDEN POOL—BEE COUNTY

Company, farm and location—Remarks:

Henderson Coquat's No. 1 Leroy Roberts, 300 ft. from W line of lease, 300 ft. N of NE cor. of Gremmel tract .....Location.

PETTUS POOL—BEE COUNTY

Henderson Coquat's No. 2 Mauldin, 647 ft. to S line, 150 ft. to W line .....T.D. 1,200 ft.; drlg.
Henderson Coquat and Barnsdall's No. 1 Leroy Roberts, 300 ft. N and E of NE cor. of Gremmel tract .....Derrick.
Houston Oil Co.'s No. 4 Portis, 310 ft. E of No. 3 Portis in A. Smaller Sur. .....T.D. 4,410 ft.; abnd.
J. L. Mauldin's No. 2 fee .....To be drilled by Henderson Coquat.
Slick-Seeligson, Inc.'s No. 5 Ray, 300 ft. E of No. 3 Ray in George A. Kerr Sur. .....T.D. 3,891 ft.; comp. 120 bbls.

COOKSEY POOL—BEXAR COUNTY

Chiquita Oil Co.'s No. 3 Cooksey, 480 ft. from E line, 330 ft. from S line of tract in J. W. Rialls Sur. .....Location.
Chiquita Oil Co.'s No. 1 Dan Kosub .....T.D. 1,579 ft.; set csg.

ECKERT POOL—BEXAR COUNTY

Alamo Nat. Gas Co.'s No. 4 Gembler in Manachaca Sur. No. 51 .....Location.
Alamo Natural Gas Co.'s No. 3 J. H. Gembler, 180 ft. from N and E lines of tract in A. Manachaca Sur. No. 51 .....T.D. 1,093 ft.; small oil well at 716 ft.; reinstated to deepen.
F. H. Eckert & Son's No. 9 Sandemer, 150 ft. to N and W lines .....Location.
F. H. Eckert & Son's No. 10 Sandemer, 400 ft. E of No. 9.Location.
F. H. Eckert & Son's No. 1 Louis Brehm, W offset to No. 3 John J. Brehm .....Location.
Gatlin Oil Co.'s No. 11 I. A. Beck, 700 ft. from SE line, 156 ft. from SW line of tract in J. Montes Sur..Location.
W. R. Swearingen's No. 8 Halbadier in Peres Sur. .....675 ft.; set csg., waiting on cement.
W. K. Oil & Gas Co.'s No. 3 Strunk, 300 ft. E of No. 2...Location.
W. K. Oil Co.'s No. 1 Strunk, 150 ft. S of N line, 150 ft. W of E line, John Grant Sur. .....T.D. 150 ft.; drlg.
W. K. Oil Co.'s No. 2 Strunk, 150 ft. from S line, 1,051 ft. W of E line, Juan Mantes Sur. .....Drlg.

SALT FLATS POOL—CALDWELL COUNTY

Joe Bruner's No. 1 Malone, 150 ft. to N line, 750 ft. to W line of tract, A. Floyd Sur. .....T.D. 2,788 ft., in Edwards, dry.
John Storey's No. 1 Dickerson, 150 ft. to N of center of S line of tract, John R. Rains Sur. .....Rigging up.

COLE POOL—DUVAL COUNTY

Cole Petroleum Co.'s No. 75 Benavides, 365 ft. from NE line, 150 ft. from NW line, Blk. 8, Sec. 18, Mariana Arispe grant .....T.D. 3,750 ft.; drlg.

GOVERNMENT WELLS—DUVAL COUNTY

Humble Oil & Ref. Co.'s No. 3 Paul White, 1,650 ft. from S and W lines of Sur. .....T.D. 1,750 ft.; drlg.

DARST CREEK POOL—GUADALUPE COUNTY

Humble Oil & Ref. Co.'s No. 4-C Denman, 650 ft. from E line, 600 ft. NE of No. 3-C Denman .....T.D. 1,050 ft.; drlg.

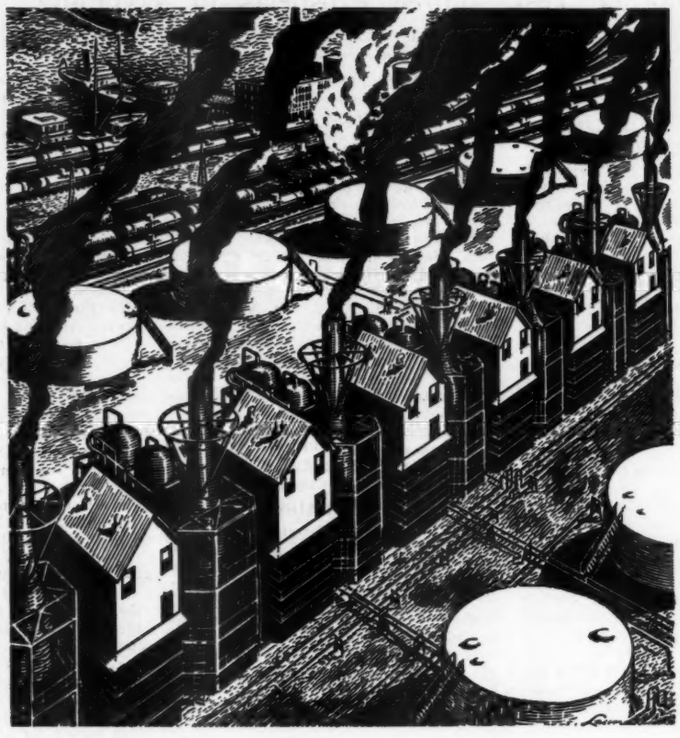
CHITTIM POOL—MAVERICK COUNTY

Texas Gas Utilities' No. 8 Chittim, 24 ft. S of No. 7 Chittim .....T.D. 5,100 ft.; standing.

SAXET FIELD—NUECES COUNTY

Gulf Coast Oil Co.'s No. 1 Perkins and LeGasse, 330 ft. from N and E lines of 245-ac. tract, Sec. 26, Shepard Subd. .....T.D. 500 ft.; drlg.

(Continued on Page 128)



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New Gas Field in Moffat County, Colo.

Greasewood Dome Discovery Well Again on Production. Yuma County to Have Another Test. Three Prospects in Wyoming

By Tolbert R. Ingram
Staff Correspondent, Rocky Mountain Area

DENVER, Colo., Mar. 28.—The proration schedule in effect in the Hobbs Pool the first half of March was continued in the second half without change. Chairman E. G. Allen has appointed a committee to investigate Hobbs prices in response to an inquiry by Governor Seligman. Two wells are drilling in Lea County. Two tentative locations were reported in Curry County. Colorado has a new gas field in Moffat County as a result of the completion of Ohio Oil Co.'s No. 1 Bogenschultz, on the Craig Dome, for 11,000,000 feet with a rock pressure of 1,240 pounds. Platte Valley Petroleum Co.'s No. 1 Patterson, the discovery well at Greasewood, again is on production, making around 200 bbls. per day. Yuma County is to have another test this year.

Additional refining facilities are being considered for the Osage Field in Wyoming. While no locations were reported, three wells in as many different districts are in prospect for this spring.

Montana had no completions or new locations.

NEW MEXICO

Lea County

Umpire C. G. Staley, of the Hobbs Pool executive committee, has advised operators that due to the fact that there is no change in pipe line connections or pipe line nominations, the proration schedule used for the first half of March will continue in effect for the last half of the month. The daily allowable outlet for the period is 31,328 bbls.

E. G. Allen, chairman of the committee in charge of Hobbs proration, has advised Gov. Arthur L. Seligman that he has appointed a committe of operators in the pool to investigate the price of crude oil. This action was in response to the governor's inquiry as to why the present price is not higher. The posted price of Hobbs crude is 50 cents at present. The committee is composed of H. M. Stalcup of the Skelly Oil Co., K. Winship of the Gypsy Oil Co. and G. O. Moody of the Mid-Continent Oil Co. None of the committee, Chairman Allen advised the governor, is connected with agencies purchasing Hobbs crude.

Only two wells in Lea County were reported active, both in the Hobbs Pool. Midwest Refining Co.'s No. 29 State, C SW SW Section 10-19-38, spudding at 31 feet, and its No. 8 Turner, C NW SW Section 34-18-38, drilling at 2,830 feet in red rock.

Eddy County

R. D. Compton's No. 1 Compton, NE NW NE Section 8-18-27, southwest of the Artesia Pool, which was reported a completion last week at a total depth of 1,239 feet, is flowing an average of 20 bbls. per day pinched to about a one-fourth choke. Compton's No. 4 Brainard, SE SE Section 5-18-27, which was standing at 1,217 feet while No. 1 Compton was being completed, has resumed and is drilling at 1,228 feet in pink lime.

Flynn, Welch & Yates' No. 1 State, NE cor. SE Section 26-20-27, southwest of the Getty Pool, is rigging up.

Grayburg Oil Co.'s No. 3 Burch, C SW NW Section 19-17-30, Jackson Pool, is shut down at 2,095 feet in anhydrite to repair engine.

New Mexico Oil Syndicate's No. 1 McClelland, C NW NE Section 22-22-23, west of Carlsbad, is an abandoned location. Two months ago when permission was granted by the Department of the Interior to drill it was stated that the location might be changed half a mile to the west.

Curry County

Two tentative locations are reported to have been staked recently in Curry County, neither of which has been verified. These are credited to G. L. Trout in Section 24-2n-31, and Cranfill Brothers in Section 13-2n-31. There has been no drilling reported in Curry County for a long time. In the vicinity of these locations, Cockerill and others' No. 1 Bruner, C N half NE Section 15-2n-31, was drilled to 960 feet in 1930.

San Miguel County

Star Oil Co., Ltd.'s No. 3 Adams, NE cor. Section 25-17s-17e, Graham district, is shut down at 5,093 feet in sandy arkose with 700 feet of 5⅜-inch pipe in the hole.

De Baca County

Landowners Oil Co.'s No. 1 McAdoo, SW cor. NE Section 16-1s-27, Buffalo Creek, ran and cemented 6⅝-inch at a total depth of 4,675 feet.

Guadalupe County

New Mexico Producing & Refining Co., Ltd.'s No. 1 McMillan, SW cor. Section 24-5n-16e, Mesa Leon district, is reported drilling at 4,213 feet in shaly lime.

Bernalillo County

Norrins Realty Co., Inc.'s No. 1 Pajarito grant, NW cor. NE Section 22-9n-1e, is fishing for casing at a total depth of 1,275 feet. The string of 12½-inch was being carried.

San Juan County

Continental Oil Co.'s No. 24, SW NW SW Section 1-29-19, Rattlesnake Dome, is bottomed at 6,904 feet and waiting for additional drill pipe. It is reported this well has failed to pick up the pay found in the deep test in Section 2, though it is below where it was expected. Faulting, or some unknown subsurface condition is considered the probable cause for the formations not correlating. It will be carried to 8,000 feet, or more, if necessary. Same company's No. 28, CNL SW Section 12-29-19, which will go only to the shallow horizons, is spudding.

R. C. Oswell's No. 2, NW NW Section 34-30-11w, near Aztec, which was reported a completion at 1,430 feet last December with an initial production of 30 bbls. per day with a show of water, has settled to 8 bbls. of oil and 5 bbls. of water.

Rio Arriba County

Governardo Dome Oil Co.'s No. 1, NW NE NE Section 15-29-7w, is underreaming the 5⅛-inch to bottom at 1,970 feet.

COLORADO

Moffat County

The principal development in Colorado was the completion of Ohio Oil Co.'s No. 1 Bogenschultz, C SE SE Section 9-6n-91, on the Craig, or Breeze structure, in Moffat County, 3½ miles southwest of the town of Craig. This is the pioneer well on the structure and opens a new gas field. The discovery was made in the base of the Mesa Verde formation. The first gas was encountered in a sand at 2,732-46 feet. Another sand was cut at 2,781-02 feet and at 2,807 feet it barely tapped the principal objective. The well gauged 11,000,000 feet with a rock pressure of 1,240 pounds the first 24 hours. It has been shut in until a pipe line to Craig and a local distribution system is constructed. The company obtained a franchise to supply Craig several months ago. Above the gas horizons this test encountered a number of water sands which produced as high as 15,000 bbls. per day. These were shut off with the 6¼-inch at 2,731 feet. There was a spray of oil with the gas. About 1,200 feet below the gas lies the Morapas sandstone, which forms the escarpment around the Iles Field. While the lower sand has possibilities for either oil or gas, it will not be tested in this well. No announcement has been made as to whether another well will be drilled to that horizon this year.

The new gas field is 6 miles east of the Bell Rock Dome, where the Midwest Refining Co. encountered a large flow of gas in the same horizon a year or two ago, but lost the gas upon drilling deeper and attempting to plug back, and abandoned the hole. No other test has been drilled on Bell Rock. Twenty miles to the southwest lies the Iles oil field, and between is the Moffat Dome. Still farther to the southwest is the Thornburg Dome where the Continental Oil Co. has three gas wells shut in capable of making 25,000,000 to 40,000,000 feet each per day. Sixty miles to the northwest is the Hiawatha gas field which supplies Utah cities and towns with a part of their gas supply. The Craig Dome has been favorably known for a long time and is shown on some of the government maps. It is cut by a fault paralleling the axis with a downthrow of about 200 feet. Approximately 1,500 acres are inside the closing contour. The Midwest Refining Co. and The Texas Company have some acreage on the structure.

Weld County

The first encouraging news out of the Greasewood area for several weeks came the past week when Platte Valley Petroleum Co.'s No. 1 Patterson, NE SE NW Section 24-6n-61, the discovery well which came in on October 10, 1930, and started the drilling campaign in that district in 1931, began flowing on March 17 after having been off production since February 15. This well, which was drilled in the face of numerous difficulties over a period of years, produced after completion with the 4¾-inch hanging 70 feet off bottom. When it stopped producing on February 15 it was reported the hole had caved and some water was showing. The 4¾-inch was underreamed to the top of the sand at 6,667 feet and cemented. When the plug was drilled out, it began flowing at the rate of 25 bbls. per hour and did not show any water, nor has any water since made its appearance. The first 24 hours it flowed 198 bbls. and in the second period it made 215 bbls. The third period put 180 bbls. into the tank, a considerable increase over what it was making when it suddenly stopped. This well produced 110,359 bbls. up to January 1, 1931.

On the same day the Patterson well came back, the Greeley Oil Co.'s No. 1 Gadbois, C NW NW Section 25-6n-61, which is being abandoned, made a flow of 127 bbls. of oil while the pipe was being pulled. It probably was accummulated oil as the well has shown a little ever since it was drilled in. Pulling of pipe continued.

While three or four wells are scheduled to be drilled to the north and east of producers this summer, no definite announcement of plans has yet taken place.

Arapahoe County

MacDeb Drilling Co.'s No. 1 Fitzsimmons, NE Section 7-4s-66, near Aurora.

(Continued on Page 142)

LETHBRIDGE TEST ABANDONED OTHERS ARE TO BE CONTINUED

By Victor Lauriston
Staff Correspondent, Canadian Fields

CHATHAM, Ontario, Mar. 27.—On the Lethbridge structure, Texas-Imperial's No. 1 wildcat, LSD 14, Section 22-8-22w4, is being abandoned after drilling into a strong water flow in the Madison limestone at 4,574 feet. The test, a few miles west of Lethbridge, got a fair show of oil just below the Ellis-Madison contact at 4,551 feet. On deepening 23 feet into the lime, the heavy salt water flow was struck.

The area is largely controlled by Lethbridge, Petroleum Co. and Benton Oils, Ltd., though both the Imperial and Texas companies have some acreage. The test was drilled jointly by Imperial Oil, Ltd., and Texas Oil Co. of Canada, operations being in charge of the former company under the general supervision of J. H. McLeod, western production manager of Imperial.

Decision to abandon the test was announced by Mr. McLeod and C. D. Meltabarger, district manager for The Texas Company. Mr. Meltabarger added that his company would not be involved in the drilling of any future wells on the structure. The Texas Company's contract required it to drill additional wells only if commercial oil production was obtained in the initial test. Imperial and Texas geologists picked out what was regarded as the most promising location on the Lethbridge structure, and The Texas Company regards the failure of this test as indicating there is little chance of commercial production on any other part of the structure.

The test was the first undertaken by The Texas Company in Canada and also the last active test in the Alberta fields in which Imperial Oil, Ltd., was interested. With the completion of the Sterling-Pacific Oil Co.'s No. 2 producer in the South Turner Valley early in January, the company's program in that field was completed. So far as can be learned, no new drilling is being undertaken in the near future by Imperial Oil, Ltd., in the Alberta fields.

Border Prospects in Madison

Texas-Imperial's No. 1 was one of a series of three tests in the border fields that got crude oil showings just below the Ellis-Madison contact. The three tests were strung in a southeast and northwest direction over more than 50 miles, the line passing about 3 miles west of Lethbridge. Of the other tests, Parco Oil Co.'s No. 1 Twin River, about 18 miles southeast of Texas-Imperial's No. 1, got the same horizon and a show of crude at 3,870 feet; while about 35 miles to the northwest Hudson's Bay Oil & Gas Co.'s No. 1 Keho got the crude oil horizon in the top of the Madison. Thus Texas-Imperial's No. 1 was midway between the other tests in point of depth. The crude sample was very similar in all cases, a fairly light oil testing between 31.5 and 33 degrees, and while the structures were apparently distinct, the pres-

(Continued on Page 130)

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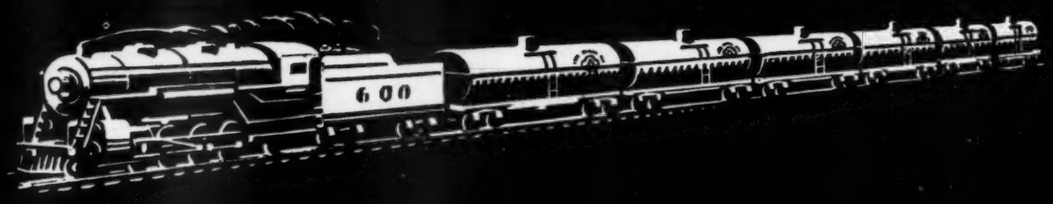

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Clamping Lid Tighter in California

Accumulation of Crude and Refined Products Forces Drastic Steps. Increased Shipments to Atlantic Seaboard. Gas Law Situation

By L. P. Stockman
Staff Correspondent, California Fields

LOS ANGELES, Calif., Mar. 26.—California marketers, confronted with a probable substantial accumulation of crude or refined oils during the next 60 or 90 days, have been obliged to take drastic steps to alleviate this condition as much as possible. During January California marketers were obliged to store 800,904 bbls. of gasoline, 406,910 bbls. of refinable crude and 248,408 bbls. of naphtha distillates. In February gasoline stocks on the Pacific Coast increased 1,196,780 bbls. and naphtha distillates increased 434,646 bbls. A similar situation confronted Pacific Coast marketers during March but, because of steps already undertaken, it is not likely the addition to stocks during this period will approach the accumulation during January and February. During the first half of March every indication pointed toward another substantial accumulation during this period, but developments during the past 10 days has necessitated a revision in the estimate as to the probable accumulation during the current month.

To alleviate the situation major companies clamped the lid on production a little tighter and will probably effect additional curtailment as all of them are desirous of liquidating excessive stocks as much as possible. In the Ventura Avenue Field the Associated, Shell and General Petroleum arbitrarily curtailed production from 40,000 bbls. per day to approximately 30,000 bbls. daily. This mutual reduction was made in spite of the fact that the Ventura Avenue Field has an allowable daily production of 40,000 bbls. In addition to alleviating the crude oil situation, the reduction in production practically eliminates all waste of natural gas, at least so far as this field is concerned. In the Santa Fe Springs Field major companies put their shoulders to the wheel and sliced off an additional 3,000 bbls. An additional 1,500 bbls. was curtailed at Huntington Beach simultaneously with the reduction of 3,000 bbls. per day in the Mount Poso Field of Kern County.

In addition to the substantial reduction effected in the production of major companies, the California situation has been further alleviated by increased shipments of refined oils in both the intercoastal and export trade. During the past week California marketers shipped 137,480 bbls. of gasoline and 46,225 bbls. of Diesel to the Atlantic seaboard for domestic consumption. Tankers in port at the present time indicate that California marketers will ship in excess of 500,000 bbls. of gasoline to the Atlantic seaboard for domestic consumption within the next few days. The aggregate liftings during this period will be reflected in the tanker report accompanying the California resume next week. It has been a long time since California marketers have been able to lay down any considerable quantity of gasoline on the Atlantic seaboard, but recent developments indicate the probability that intercoastal shipments during the current year will exceed those for 1931. As the situation stands, intercoastal shipments to the Atlantic seaboard for domestic consumption are far below the aggregate amount transported in the same trade at a comparable period in 1931. California operators do not anticipate promiscuous dumping of petroleum products on the Atlantic seaboard but will not be at all hesitant in disposing of surplus production or a gradual liquidation of existing excessive stocks. This should allay any fear on the part of Texas and Mid-Continent operators that California might upset eastern price structures.

Outlook Promising

The additional curtailment in production effected by major companies during the current month tends to indicate that the local situation should be substantially improved before the summer season sets in. The expectation of improved conditions is contingent upon the maintenance of curtailment by major companies and the ability of California marketers to dispose of gasoline and possibly fuel oil in eastern markets. Kettleman Hills and Domingues, the only two fields undergoing development at the present time, will undoubtedly be held in restraint during the next several months, irrespective of the outcome of the Sharkey oil conservation bill. If this regulatory legislation is ratified at the special election to be held May 3, the local situation should be further improved.

Gas Conservation Law

Action to enforce the California gas conservation law has been postponed until after the status of the Sharkey oil conservation bill has been determined. The action involving Santa Fe Springs operators was taken off calendar Monday, March 21, but can be placed back on calendar by either the State or any of the operators involved. The action to prohibit the waste of natural gas in the Kettleman Hills Field was postponed on March 23 for 60 days to allow operators to make a minute study of the situation with a view of possibly effecting a voluntary agreement, the outcome of which might eliminate gas wastage and make it unnecessary for the State to proceed with the injunction proceedings. Next Monday Judge Strother will decide the status of the State's affidavits, which are predicated on the theory of the existence of five productive zones in the North Dome.

It is apparent the gas conservation law will cease to be a factor if the Sharkey oil conservation bill is ratified by the electorate of the State at the special election May 3. The gas conservation law has not been repealed and will remain on the statute books even though the Sharkey bill is adopted. It will simply not be enforced unless some difficulty is experienced in regulating future production.

The future status of the gas conservation law is of particular interest because of the probable effect which it or the Sharkey bill will exert on the several gas fields throughout the State. The largest dry gas field in California is at Buttonwillow, opened by the Milham Exploration Co. a few years ago. Another accumulation of natural gas was subsequently found in the Dudley Ridge-Tulare Lake region and a third substantial accumulation in the Goleta area of Santa Barbara County. With the exception of but a short period, none of these gas fields has been on commercial gas production. The Goleta gas field, opened by the General Petroleum Co. a few years ago, was on commercial production for a short period during the past winter. The Dudley Ridge gas field has been off and on during the past several months. A similar situation has existed with respect to the Buttonwillow Field. The State Railroad Commission and the Department of Natural Resources have not permitted operators in these fields to go on commercial production because of the waste of natural gas during the past several months. Production of dry gas from these gas fields would have displaced oil gas produced at Kettleman Hills, Ventura Avenue and Elwood, with the result that it would have increased gas waste throughout the State.

Previous to the discovery of Kettleman Hills, arrangements were made by the Milham Exploration Co. and the Pacific Gas & Electric Co. to supply the San Francisco Bay region with natural gas from the Buttonwillow gas field. The subsequent discovery of production in the North Dome of Kettleman Hills changed this plan with the result that the Milham interests have been making deliveries of natural gas from Kettleman Hills instead of Buttonwillow. The Sharkey oil conservation bill and the gas conservation law may again revise the attempt to utilize natural gas from the Buttonwillow gas field. The future status of these two regulatory measures will determine whether the Buttonwillow gas field will go on commercial production this year or be held back until a later date.

To Use Buttonwillow Gas

The Milham Exploration Co. apparently expects to place the Buttonwillow gas field on commercial production next winter. At least this impression is created by the additional development work undertaken in this field during the past few months and the preparations to engage in further exploitation. Last week the company completed No. 1 Whitaker, its eleventh well in the Buttonwillow gas field, and started rig construction for a new project to be drilled on a lease from the Southern Pacific Land Co. in Section 7-28-23. The company's latest completion in the Buttonwillow gas field showed an initial daily production of approximately 25,000,000 feet per day from 2,675 feet, the hole having been finished with a 6⅝-inch liner. This well was beaned back to 4,200,000 feet per day during the three-day production test before being entirely shut in.

The Wilshire Oil Co. re-entered the Buttonwillow gas field and resumed work on No. 1 Salisbury, which has been standing idle for several months. This test, bottomed at 7,000 feet with a plug at 4,650 feet, was originally started by the Nordon Investment Co. and subsequently turned over to the Wilshire as a joint test. The General Petroleum failed to revive its Buttonwillow test in Section 6-28-23 and is accordingly pulling tubing preparatory to further work. This well was originally finished about a year ago and showed an initial daily production of approximately 15,000,000 feet. Upon re-entering the hole a few weeks ago, the company was surprised to find it had a dead hole instead of a capped gasser. The Graham & Loftus Oil Co. has cemented a string of 5¾-inch casing in its Buttonwillow test at 6,270 feet and tentative plans call for resumption of work some time during the coming week. This well is in Section 20-27-22 and will consequently extend the productive limits of the Buttonwillow Field if commercial production is secured.

Broadened Market

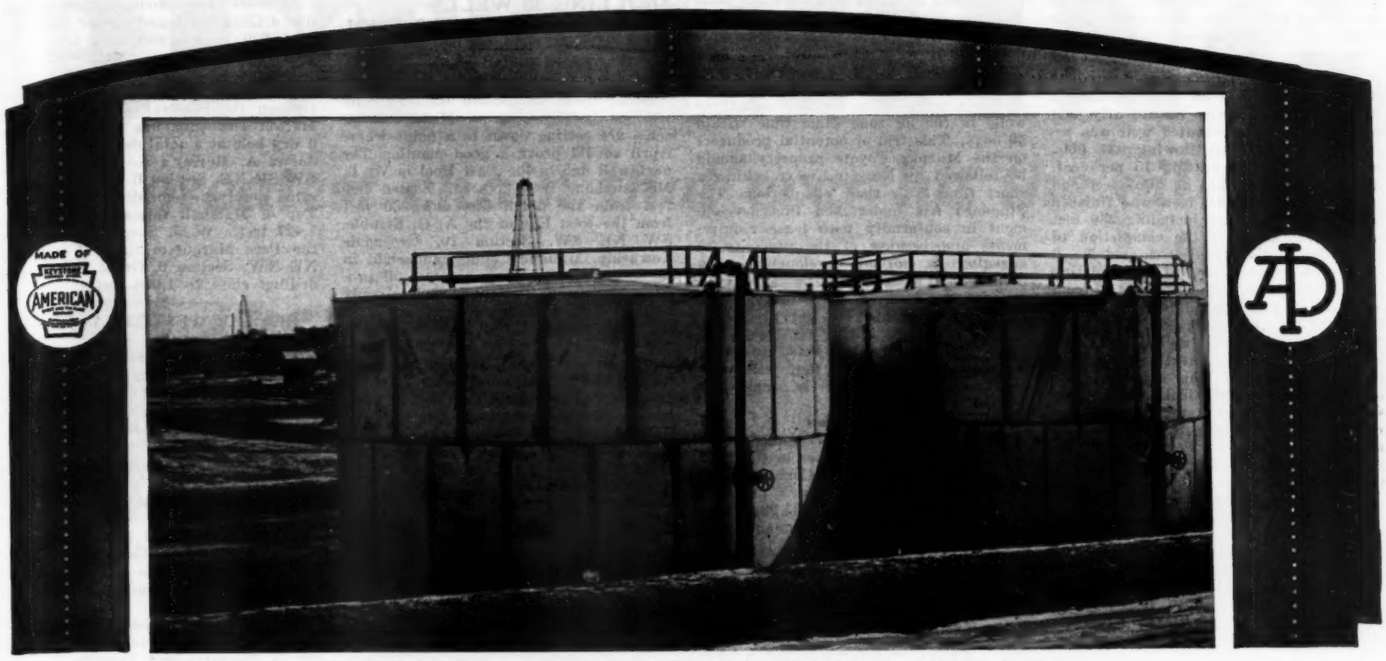
The installation of pipe lines for the transmission of natural gas from the San Joaquin Valley to the San Francisco Bay region and adjacent territory, together with the anticipated construction of a 75-mile pipe line from La Jolla to San Diego, has stimulated interest in the production and search for substantial accumulations of dry gas. This is of course natural in view of the greatly broadened market for natural gas but at the same time it is questionable whether conditions at the present time justify exploration and exploitation of gas fields. It is not likely that dry gas fields will be allowed to go on commercial production until the waste of oil gas is entirely eliminated. Auxiliary service during the winter months is hardly a paying proposition so far as dry gas fields are concerned, due to the relatively short period during which production is possible. If regulatory legislation reduces the production of oil gas, dry gas fields would then become a factor of considerable economic importance. Public utilities, due to the warm weather, have started reducing their current requirements and a further reduction in the amount of gas needed will take place during the next several months. The Pacific Gas & Electric Co., which has been moving approximately 70,000,000 feet of gas out of the San Joaquin Valley area, will probably reduce its purchases to around 50,000,000 feet per day before midsummer. Drilling operations have slowed up considerably in the Dudley Lake-Tulare Ridge region due to the inability to go on commercial gas production. Two wells have been on partial production in this area during the past two or three months but this arrangement has not been entirely satisfactory. The formation pressure is not sufficiently high to buck the line pressure of the Pacific Gas & Electric Co.'s transmission line and for this reason, together with the superabundance of

TANKER SHIPMENTS FROM LOS ANGELES TO DOMESTIC AND FOREIGN PORTS

	March 12, 1932		March 5, 1932			
	Total this week	Daily average	Total last week	Daily average	This year to date	Same time last year
Intercoastal-domestic—						
Diesel and gas oil	46,225	6,604	.....	.....	46,325	679,024
Gasoline	137,480	19,640	.....	.....	836,225	3,084,131
Foreign exports—						
Crude oil	168,813	24,116	206,686	29,527	1,339,719	1,420,312
Fuel oil	214,694	30,671	194,507	27,787	1,944,402	3,224,084
Diesel and gas oil	11,437	1,634	71,610	10,230	454,380	745,062
Gasoline	279,988	39,998	148,608	21,230	1,966,217	2,032,016
Kerosene	117,734	16,819	109,703	15,672	569,904	237,204
Lubricants	.....	.....	.....	.....	.....	6,928
Naphtha distillates	.....	.....	.....	.....	41,175	.....
Coastwise-domestic—						
Crude oil	175,590	25,084	391,426	55,918	3,037,434	3,792,590
Fuel oil	156,536	22,362	316,772	45,253	3,074,386	3,347,448
Diesel and gas oil	28,573	4,082	18,388	2,627	397,531	352,801
Gasoline	188,665	26,952	504,686	72,098	2,662,036	2,480,964
Kerosene	.....	.....	5,172	739	33,072	85,945

TANKER SHIPMENTS FROM SAN FRANCISCO TO DOMESTIC AND FOREIGN PORTS

Intercoastal-domestic—						
Gasoline	.....	.....	.....	.....	68,101	63,975
Lubricants	.....	.....	.....	.....	7,849	11,000
Foreign exports—						
Crude oil	32,365	3,195	74,866	10,695	271,458	6,010
Fuel oil	.....	.....	.....	.....	442,083	198,876
Diesel and gas oil	85,334	12,191	.....	.....	250,991	126,136
Gasoline	.....	.....	14,736	2,105	607,815	526,861
Kerosene	.....	.....	.....	.....	135,350	190,412
Lubricants	.....	.....	.....	.....	5,225	.....
Coastwise-domestic—						
Fuel oil	.....	.....	.....	.....	464,500	850,898
Diesel and gas oil	13,177	1,882	.....	.....	149,876	5,223
Gasoline	10,094	1,442	.....	.....	684,348	492,207
Kerosene	.....	.....	.....	.....	10,857	22,829



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natural gas at Kettleman Hills, operators at Dudley Ridge have been unable to go on permanent production.

Dominguez

The Associated Oil Co. recompleted its No. 12 DeFrancis in the Dominguez Field of Los Angeles Basin early last week, and this rejuvenated well was returned to production flowing 931 bbls. of 22.9 gravity oil cutting 15 per cent. This project, bottomed at 4,667 feet and plugged back to 4,500 feet, was finished with a 6⅝-inch liner including 230 feet of perforated. Upon the completion of this well the Associated re-entered No. 5 DeFrancis preparatory to recompleting it after redrilling and deepening it from 4,655 feet to the 4,500-foot level. The Shell Oil Co. is making good footage in No. 42 Reyes, a new well, following a delay of several days' duration occasioned by lost circulation. This condition was corrected by the introduction of cotton seed hulls into the hole and, following the recovery of circulation, drilling was resumed. The Republic Petroleum is rigging up rotary equipment in its first test to be located on the Childs lease, on the north flank of the structure adjoining the Hellman property of the Union Oil Co. on the east and the Reyes property of the Union and Shell, which parallels the southern boundary of the Childs lease. The Republic Petroleum originally contemplated drilling a deep test on the Dominguez lease of the Richfield Oil Co. but passed up this opportunity in favor of the Childs lease. J. E. (Jim) O'Donnell took up where the Republic left off and will redrill and deepen the Richfield Oil Co.'s old No. 2 Dominguez. This hole, bottomed at 4,447, has been cleaned out to within 150 feet of bottom and the fish remaining in the hole is expected to be either removed or sidetracked in the near future. The Union Oil Co., Shell and Associated are still considering the advisability and possibility of unifying drilling and production activities in the Dominguez Field and, while satisfactory progress has been made, there are still some minor details to be worked out before the proposition can be submitted for the ratification of lessors and other interested parties.

Playa Del Rey

The Woods-Callahan Oil Co. recompleted No. 7 Venice in the Playa Del Rey Field of Los Angeles Basin early in the week and returned it to production flowing 430 bbls. of relatively clean 23.2 gravity oil per day. This well, flowing under a pressure of 470 pounds, was bottomed at 5,836 feet and finished with a 3-inch liner carrying 441 feet of perforated. The Playa Del Rey Field, scene of considerable activity along about this time last year, is unusually quiet at present. With the exception of few reconditioning jobs, there are only one or two uncompleted drilling projects under way. One is Union Oil Co.'s No. 4 Del Rey, a direct offset to the company's No. 1 Victor, which is flowing 140 bbls. of exceptionally clean 23.2 gravity oil per day. These two wells are in the extreme eastern part of the field and, while the Union has a number of undrilled locations between these wells and the older producing section, it is not the intention to proceed with this development work until later.

The Standard, which is running five strings of tools in the West Coyote Field of Los Angeles Basin, should finish three wells in the 99 zone some time within 30 days. This trio of potential producers on the Murphy Coyote property should be followed by No. 50 Emery within a short time after their completion. The Standard has undertaken this development in conformity with lease requirements and because of the necessity of engaging in normal development even though these wells must be curtailed upon completion. Drilling operations in the Long Beach Field were not productive of any new wells during the week and, while two or three projects are being prepared for completion, they will probably register only relatively small production.

Midway-Sunset

The Standard Oil Co. completed one well and spudded in another in the Midway-Sunset Field of Kern County during the week. The company's new producer was No. 108 in Section 35-31-23, which was brought in on the beam pumping 54 bbls. of 27.1 gravity oil per day from 3,092 feet. The new hole started was No. 105 in Section 33-31-24. The Bluerock Oil Co.'s No. 1 Fairhaven in the Fruitvale Field of Kern County failed to respond to swabbing operations of several days' duration and preparations are being made to put it on the beam. The Bankline Oil Co. and the Plymouth Oil Co. should each chalk up a new producer in this field within 10 days, as both projects are rotating in the oil sand at present. The Western Gulf, which has found it necessary to drill three new wells because of offset requirements, should finish two of the three wells now under way some time during April. The Belridge Oil Co. has landed a string of 8⅝-inch casing in its well No. 54, a deep test in the North Belridge Field of Kern County. This well, bottomed at approximately 8,050 feet and located in Section 27-27-20, is expected to be given a production test from the Kreyenhagen shale. The outcome will be watched with considerable interest because if substantial production is secured in the Kreyenhagen it should tend to indicate the existence of a similar productive formation at Kettleman Hills and possibly in other similar areas.

INCREASE CANADIAN TAXES

CHATHAM, Ontario, Mar. 26.—Legislatures of most of the Canadian provinces have increased or are expected to increase the taxes on gasoline this year. In New Brunswick the tax has been raised from 5 cents to 7 cents, and in Quebec from 5 cents to 6 cents. Ontario and Manitoba are increasing the tax from 5 cents to 6 cents, and British Columbia proposes to increase from 5 cents to 7 cents. In Alberta, Saskatchewan, Prince Edward Island and Nova Scotia the tax is expected to remain at 5 cents.

DRILLING 30 WELLS IN MICHIGAN'S POOL

By George A. Whitney

MOUNT PLEASANT, Mich., Mar. 28. Another week has passed with no completions in any part of Michigan, but some are getting down to a point where April should prove a good month. The next well due in the East Pool is W. L. McClanahan, Inc.'s No. 4, located 990 feet from the north line and 330 feet from the west line of the A. G. Struble, SW NE SW, Section 10, Greendale Township, Midland County, and right in the heart of Michigan's greatest oil producing territory. The three wells already completed on the Struble property were all large producers, far above the average. When the first test was drilled on the Struble farm last July the territory in that vicinity had been little explored. The new East Pool is 2½ miles east of the old Chippewa-Greendale Pool. Approximately 20 producing wells have been completed in the pool since the Hornick discovery well was brought in. There are about 30 wells under way and considerable wildcatting is being done to the north and northeast. Two new ventures under way in the East Pool that attract much attention are being drilled by W. L. McClanahan, Inc., one on the W. S. Root farm, NW NE SW, Section 12, Greendale Township, about 1½ miles east of the Struble farm, and No. 1 Corning Estate, SE SW SW, Section 2, same township and northeast of the Struble farm. These two important tests are expected to be completed within two weeks barring any bad luck. Should these tests prove productive, oil men predict drilling north and east of the present pool will be renewed with feverish activity.

Late advice from the Clare County area is that the Mammoth Petroleum Co.'s deep test on the Bothwell farm, Section 15, Hatton Township, has been given up as a dry hole at a total depth of 4,090 feet. James A. McKay's No. 9 McKay farm, SW SE NE, Section 6, Grant Township, same county, is shut down at 1,483 feet. Top of Marshall formation is found at 1,427 feet. W. J. Sovereign's No. 1 on the Pere Marquette right of way, SW NE NW, Section 6, Grant Township, is drilling close to 1,000 feet.

RENAME WEST TEXAS FIELDS

FORT WORTH, Tex., Mar. 28.—A committee representing the West Texas Geological Society, composed of J. Ben Carsey, district geologist for the Humble Oil & Refining Co.; Robert E. Rettger, district geologist for the Sun Oil Co.; and Dr. Hal P. Bybee, geologist and mineralogist for the University Land and Lease Board, San Angelo, are considering the most appropriate names for each of the more than 30 oil pools in 18 counties of West Texas. Geologists at Houston and San Antonio have already reported upon the nomenclature of fields in those districts.

The West Texas Geological Society is to foster a field trip to the Solitario uplift in Brewster and Presidio Counties, Saturday and Sunday, May 14 and 15. The geologists will meet at Marfa, Friday night and Saturday morning.

IMPORTANT SOUTHERN CALIFORNIA WILDCATS

Company, well and location—	S.-T.-R.	Depth	Status—
Hines Pet., No. 1 Ocean Park, Los Angeles Co.	9- 2-15	7,414	suspended
Taylor Oil Co., No. 1 Culver, Los Angeles Co.	12- 2-15	6,238	suspended
Westwood Oil Co., No. 2 Hermosa, Los Angeles Co.	6- 4-14	2,151	suspended
Staple Oil Co., No. 1 Manhattan, Los Angeles Co.	24- 3-15	2,700	suspended
Lawndale Pioneers, Inc., No. 1 Peck, Los Angeles Co.	20- 3-14	6,378	testing
Barcus, W. I., No. 1 Watson, Los Angeles Co.	28- 4-13	....	grading
Brubaker, W. O., No. 1 Van Nuys, Los Angeles Co.	11- 2-15	2,700	suspended
Rucker & Croul, No. 2 Puente, Los Angeles Co.	27- 2-10	2,200	suspended
El Dorado Oil Co., No. 1 Puente, Los Angeles Co.	30- 2-9	2,261	gr. sd. drilling
Cudahy Oil Co., No. 1 Bell, Los Angeles Co.	30- 2-13	1,370	suspended
Jones, W. L., No. 1 Bell, Los Angeles Co.	31- 2-12	1,593	sd. sh. drilling
Weist Oil Co., No. 1 Montebello, Los Angeles Co.	34- 1-11	4,902	suspended
Blinn & Gray, No. 1 Montebello, Los Angeles Co.	6- 2-11	5,060	recemented
Wardell & Menichini, No. 1 Monte'ello, Los Angeles Co.	7- 2-11	rig	rigged up
Yellowstone Oil Co., No. 1 Alhambra, Los Angeles Co.	24- 1-13	3,919	suspended
Yellowstone Oil Co., No. 3 Alhambra, Los Angeles Co.	19- 1-13	2,015	suspended
Davidson Oil Co., No. 1 Monterey Park, Los Angeles Co.	32- 1-12	....	location
Rucker, L. W., No. 1 Calabasas, Los Angeles Co.	26- 1-17	1,004	suspended
Caballero Estates, No. 1 Calabasas, Los Angeles Co.	23- 1-16	1,480	hd. sd. drilling
Marble, Willard, No. 1 Chatsworth, Los Angeles Co.	6- 2-16	1,395	suspended
Ajax Pet., No. 1 Newport, Orange Co.	21- 6-10	7,259	to set pipe
Beck, Alfred, No. 1 Corona, Riverside Co.	8- 4-6	1,110	suspended
Spindletop Oil Co., No. 1 Salton Sea, Riverside Co.	25- 7-10	3,590	suspended
Duncan, N. I., No. 1 Sagebrush, Riverside Co.	8- 4-6	1,157	suspended
Colan Dev. Co., No. 1 Redlands, San Bernardino Co.	25- 1-3	2,392	sidetracking
Mason Oil Co., No. 1 Salton Sea, Imperial Co.	1-17-15	649	sd. sh. drilling
Woods, D. H., No. 1 Salton Sea, Imperial Co.	7-11-16	730	sd. sh. drilling
Borderland Oil Co., No. 2 Encinitas, San Diego Co.	12-13-4	2,610	cemented
South Bay Oil Co., No. 1 Border, San Diego Co.	31-18-2	1,243	suspended
Itasca Pet. Co., No. 1 Mesa, San Diego Co.	33-18-1	1,700	cemented
Oklahoma Oil Corp., No. 1 Palma, San Diego Co.	25-11-1	1,820	sd. sh. drilling
Shannon, C. H., No. 1 Kearney, San Diego Co.	14-15-3	791	sd. sh. drilling

IMPORTANT NORTHERN CALIFORNIA WILDCATS

Company, well and location—	S.-T.-R.	Depth	Status—
Standard, No. 1 Santa Rosa Island, Santa Barbara Co.	.....	....	building road
Barnsdall, No. 1 Los Alamos, Santa Barbara Co.	31- 8-33	3,207	sd. sh. drilling
Western Gulf, No. 1 Santa Maria, Santa Barbara Co.	5- 9-33	8,566	reaming
Midwest Oil Co., No. 1 Los Alamos, Santa Barbara Co.	2- 7-35	3,450	cleaning out
General Pet., No. 4 Goleta, Santa Barbara Co.	10- 4-29	1,330	abandoning
General Pet., No. 133 Goleta, Santa Barbara Co.	21- 4-28	2,030	suspended
General Pet., No. 134 Goleta, Santa Barbara Co.	21- 4-28	2,053	suspended
General Pet., No. 136 Goleta, Santa Barbara Co.	21- 4-28	2,047	suspended
General Pet., No. 137 Goleta, Santa Barbara Co.	21- 4-28	2,050	suspended
Bowles Oil Co., No. 140 Goleta, Santa Barbara Co.	21- 4-28	2,065	suspended
Johnson, G. W., No. 1-A Goleta, Santa Barbara Co.	19- 4-27	5,550	sd. sh. drilling
Sovereign Oil Co., No. 1 Guadalupe, Santa Barbara Co.	20-10-35	5,500	suspended
Pacific Western, No. 1 Gibralter, Santa Barbara Co.	14- 5-27	2,345	suspended
Pacific Finance Co., No. 1 Carpinteria, Santa Barbara Co.	Tideland	2,011	suspended
Associated, No. 1 Rincon Creek, Ventura Co.	19- 4-24	2,080	suspended
Woodrow Pet., No. 1 Miguelito, Ventura Co.	4- 3-24	....	grading
Bell, H. H., No. 1 South Mountain, Ventura Co.	22- 3-21	2,484	suspended
Pure Oil Co., No. 1 S. F. Canyon, Ventura Co.	15- 4-21	2,591	suspended
Magu Synd., No. 1 Oxnard, Ventura Co.	17- 1-25	5,438	resume work
Sycamore Oil Co., No. 1 Conejo, Ventura Co.	24- 1-20	1,670	abandoning
American Oil Co., No. 1 Conejo, Ventura Co.	33- 2-20	1,590	cleaning out
Graham & Loftus, No. 1 Goose Lake, Kern Co.	20-27-22	6,560	cemented
General Pet., No. 1 Buttonwillow, Kern Co.	6-28-23	2,615	cleaning out
Wilshire Oil Co., No. 1-A Buttonwillow, Kern Co.	7-29-24	7,000	testing
Milham Expl. Co., No. 11 Buttonwillow, Kern Co.	8-28-23	2,675	5,000,000 ft. gas
Milham Expl. Co., No. 12 Buttonwillow, Kern Co.	7-28-23	mtl.	building rig
Purman, T. H., No. 1 McKittrick, Kern Co.	22-29-21	3,450	sd. sh. drilling
Welport Oil Co., No. 8 McKittrick, Kern Co.	26-29-21	1,298	cleaning out
Federal Drlg. Co., No. 1 Buena Vista, Kern Co.	20-31-24	5,380	suspended
General Pet., No. 1 Belridge, Kern Co.	30-28-21	8,260	suspended
Wallace, K. C., No. 1 Belridge, Kern Co.	32-29-21	4,222	suspended
Rio Cal Pet., No. 1 Shale, Kern Co.	2-27-18	2,355	suspended
Wicker, Sy., No. 1 Arvin, Kern Co.	12-30-28	3,850	suspended
Fullerton Oil Co., No. 4 Semitropic, Kern Co.	9-28-24	2,450	sd. sh. drilling
Cumberland Oil Co., No. 2 Devils Den, Kern Co.	17-26-18	3,225	suspended
Totem Oil Co., No. 1 Devils Den, Kern Co.	29-25-19	rig	suspended
Regina Oil Corp., No. 1 Mojave, Kern Co.	26-10-14	2,740	sd. sh. drilling
Meridian Oil Co., No. 1 Mojave, Kern Co.	11- 9-15	4,000	suspended
Kendall Dev. Co., No. 1 Mojave, Kern Co.	27-11-9	1,139	to abandon
Harding, J. B., No. 1 Mojave, Kern Co.	5-10-10	1,030	redrilling
Barnsdall Oil Co., No. 1 Tejon, Kern Co.	15-11-20	4,902	sd. sh. drilling
Ritchie, J. J., No. 1 Tejon, Kern Co.	33-11-19	6,025	suspended
Descanso Oil Co., No. 1 Tejon, Kern Co.	31-11-19	2,730	hd. sd. drilling
Associated, No. 1 Jacalitos, Fresno Co.	22-21-15	6,197	suspended
Kingsburg Expl. Co., No. 1 Kingsburg, Fresno Co.	30-16-23	2,430	cleaning out
Kent & McDonald, No. 1 Carrizo, San Luis Obispo Co.	3-32-22	2,630	suspended
Trav-El Oil Co., No. 1 Carrizo, San Luis Obispo Co.	7-32-22	2,450	suspended
Indian Dome Oil Co., No. 1 Edna, San Luis Obispo Co.	26-31-12	3,380	suspended
Martin, J. D., No. 1 Edna, San Luis Obispo Co.	5-31-13	3,070	suspended
Paso Robles Oil Co., No. 1 Edna, San Luis Obispo Co.	27-27-11	4,191	sd. sh. drilling
Emerich Oil Co., No. 1 Atascadero, San Luis Obispo Co.	13-28-12	1,945	cemented
Schilling, C., No. 1 Atascadero, San Luis Obispo Co.	1-29-12	1,650	suspended
Pacific Inland, Well No. 1, Monterey Co.	19-23-15	2,280	suspended
Brown, W. F., No. 1 Parkfield, Monterey Co.	15-23-14	1,051	cleaning out
Guess, E. B., No. 1 Corcoran, Kings Co.	7-21-21	6,197	suspended
Niel, W. B., No. 1 Dudley Ridge, Kings Co.	32-22-20	rig	suspended
Guess, E. B., No. 1 Dudley Ridge, Kings Co.	12-22-22	2,210	abandoning
Kettleman Natural Gas Co., No. 1 Dudley Ridge, Kings Co.	18-22-19	1,100	suspended
Irma Investment Co., No. 2 Dudley Ridge, Kings Co.	7-23-20	1,224	cleaning out
Eagle Oil Co., No. 1 Dudley Ridge, Kings Co.	15-23-20	1,125	suspended
Valley Expl. Co., No. 1 Dudley Ridge, Kings Co.	12-23-19	1,302	suspended
Knudsen & Schmidt, No. 1 Reef Ridge, Kings Co.	36-23-17	5,894	suspended
Seymour, L. W., No. 1 Avenal, Kings Co.	10-23-16	1,148	suspended
Tulare Basin Gas Co., Well No. 1, Kings Co.	2-23-19	1,193	gas—shut in
Magee & Stone, No. 1 Alpaugh, Kings Co.	34-24-22	2,480	sd. sh. drilling
Tulaco Oil Co., No. 1 Corcoran, Tulare Co.	20-22-22	rig	suspended
Ducor Pet. Co., No. 1 Ducor, Tulare Co.	14-24-27	2,200	redrilling
Inland Valley Oil Co., No. 1 Visalia, Tulare Co.	24-17-24	2,092	suspended
Gravity Expl. Co., No. 1 Alpaugh, Tulare Co.	11-24-23	913	sd. drilling
Ellis & Sanford, No. 1 Tulare Lake, Tulare Co.	20-24-23	1,920	suspended
Twin State Oil Co., No. 1 Point Arena, Mendocino Co.	14-12-17	7,694	suspended
Napa Oil Co., No. 1 Griffith, Napa Co.	7- 8-3	2,843	cemented
Orinda Pet., Well No. 1, Contra Costa Co.	32- 1-3	2,120	suspended
Colusa Oil Co., No. 1 Bush, Colusa Co.	31-15-4	1,040	suspended
Oakdale Oil Co., No. 1 Oakdale, Stanislaus Co.	3- 2-10	4,750	suspended
Hilderbrandt, R., No. 1 Crows Landing, Stanislaus Co.	36- 6-7	1,130	suspended
Orland Oil Synd., No. 1 Orland, Tehama Co.	31-23-3	3,040	suspended
Pacific Northern Oil Co., No. 1 Guinda, Yolo County	23-12-3	2,005	cleaning out
Easton & Monell, No. 1 Colma, San Mateo Co.	25- 3-6	3,099	sd. sh. drilling

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The greatest chain that ever hit the oil fields

The New Deepwell Lock Cotter

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Positive Lock

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On Every Link (including the connecting links)

Stocked in all active oil fields

AGAIN the Chain Belt Company announces an improvement on Rex Deepwell Chabelco. The greatest chain that ever hit the oil fields is improved again by the addition of the Rex Lock Cotter. This Cotter Pin is solid. It is tapered to provide a tight drive fit, and is grooved with three double tapered triangular grooves that take a firm and solid "grip" in the alloy steel chain pin.

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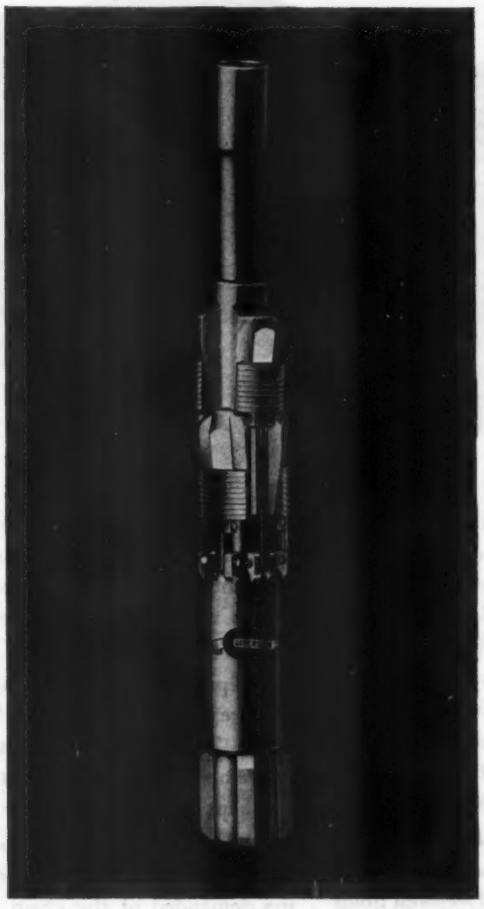

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GUIBERSON
BETTER BE SAFE THAN SORRY

New Field Opened in Hart County, Ky.

Expected to Be Larger Than the Legrande Pool. Seven Completions in Central Ohio Field, Only Three Oil. Indiana and Illinois Blank

By George A. Whitney
Staff Correspondent, Central West Fields

FINDLAY, Ohio, Mar. 28.—The Central West Field, comprising the Lima Field, Central Ohio, Indiana and Illinois, reported very few new wells, there being but seven in the Central Ohio division and one in the old Lima Field, as Indiana and Illinois failed to bring in any wells.

In the Lima Field of northwestern Ohio the only completion reported was McPheron and others' No. 1 David Fox farm, Section 11, Hopewell Township, Seneca County, in the Tiffin Field, which is reported showing for 1,000,000 feet of gas in the Trenton lime from 1,466-86 feet. There are four wells under way in the same township, J. L. Barrett's No. 1 T. N. Einsel, Section 1; Clarence Donnell's test on the Frank Bosler farm, same section; Sandusky Gas Co.'s No. 1 Lloyd Hoover farm, Section 3, and the Tiffin Industrial Gas Co.'s No. 2 Frank Feasel farm, Section 2.

In Lucas County, four wells are under way, of which three are drilling and one rig up. The drilling wells in Monclova Township of this county are M. Gray and others' No. 1 Keil Brothers farm, Section 28; Dillon & McFrederick's No. 1 H. A. Goldbrath farm, Section 29, and John Doblinger's No. 1 Solomon Butts farm, Section 8. Doblinger also has a rig up for No. 1 on the Knauss farm, same section, while in Providence Township R. B. Weed and others have a rig in for No. 2 Emmett Holloway farm, Section 29.

Nelson H. Pember of Findlay has secured a block of leases in the southwestern part of Wood County about 1½ miles west of Hoytville, and has let a contract for the drilling of a test to George Brothers, of Findlay, the well being on the old Gault farm, which is west of North Baltimore. Should this test prove worthwhile, it will extend the old field somewhat to the west.

CENTRAL OHIO

Seven completions were reported from the Central Ohio Field of which three were producers with an initial production of 17 bbls., two were gas and two were dry holes.

In Richland County the Commonwealth Gas Corp. drilled in a light gas well on the Angeline Cates farm, Section 11, Jefferson Township, the gas being found in the Clinton formation from 2,449-51 feet.

In Athens County, Waterloo Township, the Standard Natural Gas Co.'s test on the J. R. Young farm, Section 12, produced only an initial of 1 bbl. in the Berea sand from 1,037 feet.

Stark County reported one completed well, Ohio Fuel Gas Co.'s No. 1-5,602 Elizabeth Harmount farm, Section 21, Jackson Township, which was a fair gas well, in the Clinton lime. Same company is drilling No. 2-5,647 William J. Hitz, Section 16, same township.

Guernsey County reported two completions, both dry holes, Charles Smith's No. 1 William F. and Anna M. Dixon farm, Section 10, Cambridge Township, in the Berea sand from 1,265-71 feet, although there was a very light showing of oil, and C. C. Wharton's No. 3 Besse Taylor farm, Section 13, Westland Township, at a depth of 832 feet.

Ramage and Willis are drilling No. 3 Frederick Armbruster, Lot 89, Grafton Township, Lorain County. Cammeron and others are drilling on the F. H. Mason, Section 13, Franklin Township, Summitt County. The Atha Co. is drilling on the Jacob S. Morrison, Section 15, Union Township, Muskingum County.

In Fairfield County, City Natural Gas Works is drilling on the William M. Kerr farm, Section 29, Richland Township, and is drilling No. 3 E. Ruff farm, Section 2, Berne Township, same county. Same company is drilling around 1,900 feet on the John D. Shull farm, Section 30, Marion Township, Hocking County.

In Morgan County Kepple ond others hit water in the Injun sand at 1,250 feet in No. 5 Anna M. Gradoff farm, Lot 41, Windsor Township, and has been abandoned.

In Meigs County Joe Rubin and others are drilling around 800 feet on the E. G. Harper, Section 27, Salisbury Township. Simpson & Rice have shut down at 85 feet on the Reno Karr farm, Section 11, Sutton Township, same county.

Settles Oil Co. is drilling around 2,700 feet in No. 6 Nellie Smith farm, Section 17, Perry Township, Licking County. Whittmer & Clay are around 1,200 feet on the R. L. Rine farm, Section 6, Pike Township, Coshocton County.

KENTUCKY

The present activity in development work in Kentucky is centered near the town of Bonneville and Priceville, in the northwestern part of Hart Country, and indications are the new field will prove a larger producing territory than the Legrande Pool. The oil in the Bonneville area does not come from the same formation as in the Legrande Pool. Bonneville formation is a lime formation while the Legrande is the Corniferous, Legrande being a slightly better crude.

The Bonneville Field is thought to be the largest yet found in Hart County. Several rigs are being operated in the field and the operators are looking forward to the laying of a pipe line at an early date which will take care of their oil, shipping either from Bonneville or Munfordville. There are several nice gas wells in the field which have been a source of fuel for the rigs which are drilling. One of the operators in this field has had considerable experience in the pipe line end of the industry, as well as the producing end of the game. This is H. Z. Clark, who opened some nice production a few years ago in both southern Kentucky and northern Tennessee. He was formerly field man for the old Paragon Refining Co. of Toledo, Ohio.

Dr. Charles C. Taliaferro, Jr., of

(Continued on Page 123)

Deep Test in Ohio Continues Flowing

Another Test in Washington County Being Drilled to Third Warren Formation. Deep Gas Producer in Wood County W. Va.

By Staff Correspondent

PITTSBURGH, Pa., Mar. 28.—Completions continue scarce in the three districts of the lower eastern fields. Seven wells were completed and one dry hole. Two were producers with an initial production of 23 bbls., and the remaining five were gas wells.

With the continuing of restrictions on production in the eastern fields, a close relation is being maintained between production and consumption in the lower fields, none of these districts having added anything to storage during the month. There is a present oversupply in the upper country, which may be absorbed as the seasonal demand advances.

SOUTHEAST OHIO

The deep sand test in eastern Washington County, Ohio, of William Harris and others on the Joseph Crago farm, Cady Run, Grandview Township, continues to make a flow of about 100 bbls. every 48 hours, with no further work having been done on the test. Interest has been quickened by the report of another test about 6 miles southwest of the Crago producer, which is being drilled down to the third Warren formation. On the Ada Edwards farm, on Dana's Run back of Newport, J. L. Swingle and others are reported within 300 feet of the new pay and the well is expected in during this week. This is an old test which had been standing at about 2,000 feet and drilling was resumed with the news of the recent strike. To date the log has correlated closely with the Crago test and scouts are watching closely as production from the third Warren in this direction will confirm the intermediate farms which have all been leased.

In Grandview Township, Washington County, in view of the third Warren production, the following new work has started: E. J. Mildren has a rig standing for a deep test on the William Barber farm. Thomas McVey and others will drill their test on the Cordroy Sisters farm, Grandview Township, from 1,827 feet to the third Warren sand. In Independence Township, J. F. and Anna B. Campbell have started their No. 4 on the Ed Matheny farm and have reached 500 feet.

Completions

But three wells were completed in Southeast Ohio and two of these were producers. In SE Section 15, Union Township, Muskingum County, the Atha Oil Co. completed a test on the Jacob Morrison farm. It was drilled in the Niagara Lime at a depth of 3,065 feet and is showing for about 20 bbls. a day. In Washington County the First National Bank of New Matamoras account No. 7 completed a second test on the E. F. Piatt farm, on Wilson Run, Section 3, Ludlow Township. After shot, it produced about 3 bbls. the first day from the Cow Run sand at 610 feet. This well may be drilled deeper to the third Warren sand.

In Perry County, SE Section 10, Reading Township, the Mid-East Gas Co. completed a fair gas well on the Deaver heirs farm. It was drilled in the Clinton sand at a depth of 3,090 feet and is rated at 400,000 feet a day. There was no showing of oil in the sand.

The test of the Pure Oil Co., Midland division, on the Pius Snyder in NW Section 11, Reading Township, Perry County, reported last week as showing for a very fair well, was confirmed by the shot. From the initial natural production of 5 bbls. with 300,000 feet of gas, the well was increased and is now rated at 145 bbls. a day.

Drilling in Ohio

In Licking County, the test of the Emerald Petroleum Co. on the S. A. Tarlton farm in Section 8, Fallsbury Township, is in the sand and has a showing for an oil producer. In Coshocton County, McClay Brothers and others are drilling on the Henry M. Rine farm, Section 6, Pike Township. It has reached 2,600 feet. In Tuscarawas County the Gordon Oil Co. has made a location on the Martha Carrol farm, Lot 32, Washington Township.

In Guernsey County, the Ohio Producing & Refining Co. is hauling in rig material for a second test on the E. C. and Verna A. Quillan farm, Section 10, Wheeling Township. In Monroe Township, E. C. Quillan and others have made a location on the A. K. Shearer farm, Section 5. In Jefferson County, J. D. Jackson & Co. have a test drilling on the John Williamson farm, Section 17, Island Creek Township. It is 700 feet deep.

WEST VIRGINIA

There were but two completions in West Virginia and an additional dry hole. The most interesting test, though a small gas well, was a deep well in Wood County. In Lubeck district, Walter H. Bickel completed a test on his own property in the Niagara lime at a depth in excess of 4,200 feet. The test is a light gas well estimated at 30,000 feet a day. This is probably the deepest test in the county as most of the producers and few gas wells are in fairly shallow sands.

In Jackson County, on the right fork of Sandy Creek in Ravenswood district, the Jerk Water Oil Co. drilled a test on the D. E. Cole farm through the Berea sand which was dry as also were the other more shallow sands. The total depth was 2,428 feet.

In Wetzel County the Pittsburgh & West Virginia Gas Co. completed No. 11 on the J. P. Ashcraft farm at the head of Four-Mile Run, a branch of north Fishing Creek, in Grant district. It went to the Gordon sand at 3,264 feet and is rated as a light gas well.

Drilling in West Virginia

In Roane County the deep test of the United Fuel Gas Co. on the J. W. Hinzman farm in Curtis district is still at 9,100 feet and fishing is going on for the tools which are stuck in the hole. In the same district, W. B. Heeter has reached 850 feet on the T. C. Burdette farm. In Spencer district, George Smith and others have shut down after spudding in and reaching 140 feet on the C. A. Connally farm. No progress has been made at the J. P. Young and others' rig on the C. A. Kendall farm.

Activity in Calhoun County is dwindling with but few wells now drilling. In Lee district, F. F. McIntosh has reached 500 feet in No. 4 on the John Riddle farm. In the same district, this operator has the materials on the ground for No. 3 on the Fox and Morgan lease and has made a location on the C. Shaffer farm. In Washington district, Holly Jarvis and others have reached 1,400 feet on the Hoke Jarvis farm and have made a location on the L. H. Crookshank farm. In Sherman district, T. J. and A. H. Jackson are fishing for tools in No. 3 on the T. J. Jackson farm and at a depth of 830 feet. In the same district Creed Barker and others are building a rig on the A. J. Huffman farm. In Center dis-

(Continued on Page 130)

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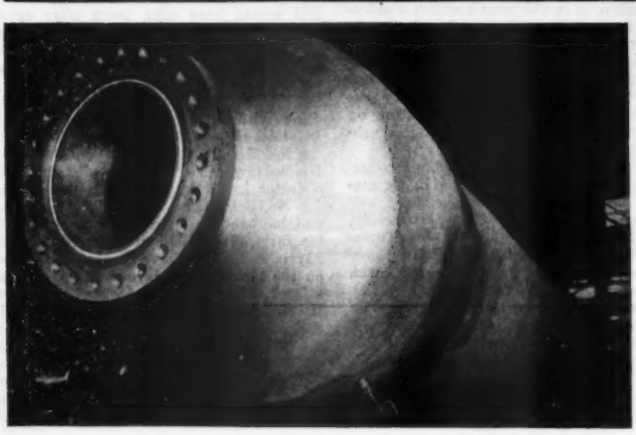

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The Oil and Gas Journal

Annual Refinery Number

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Technical and Descriptive Articles on New Developments.

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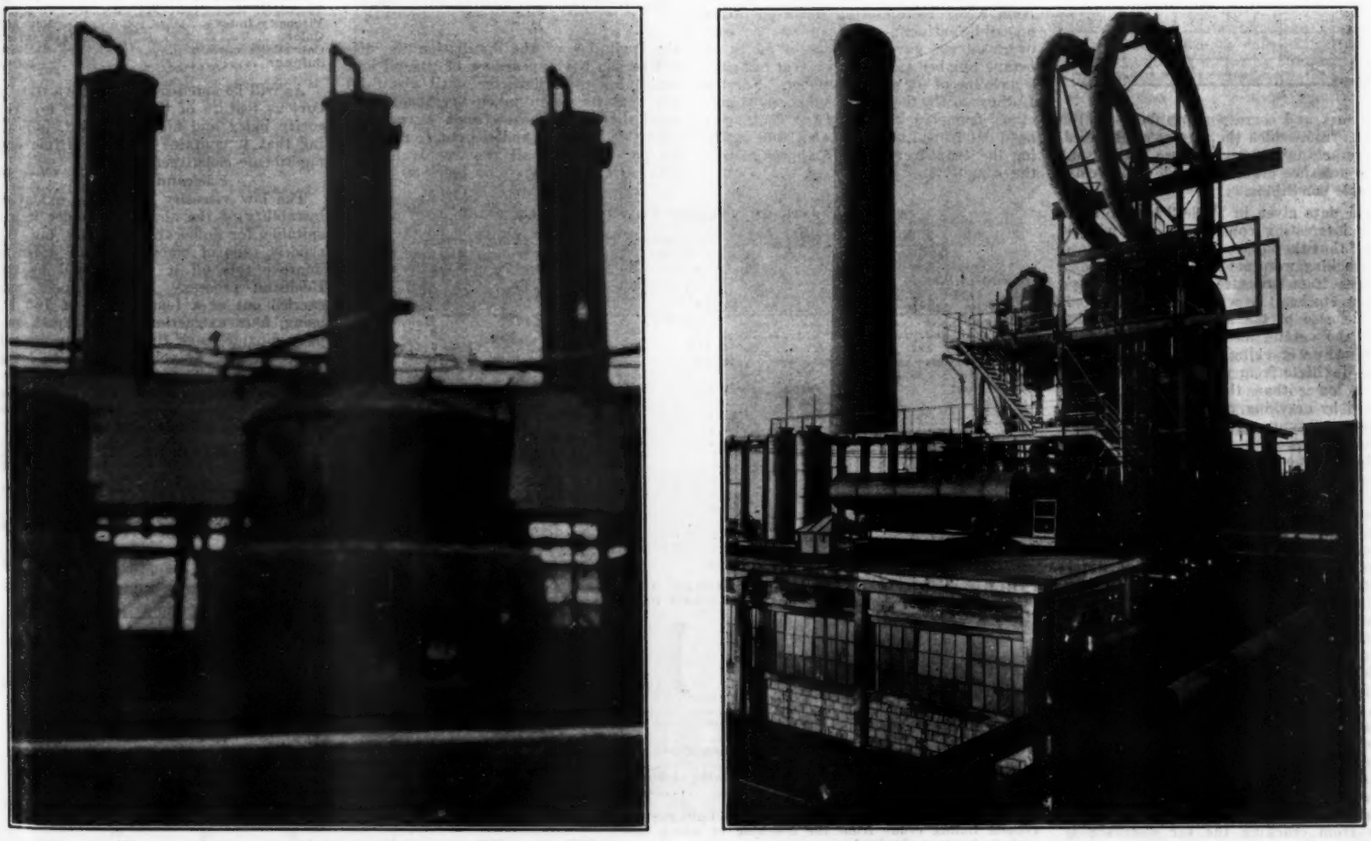

The Old and New in Petroleum Refining.

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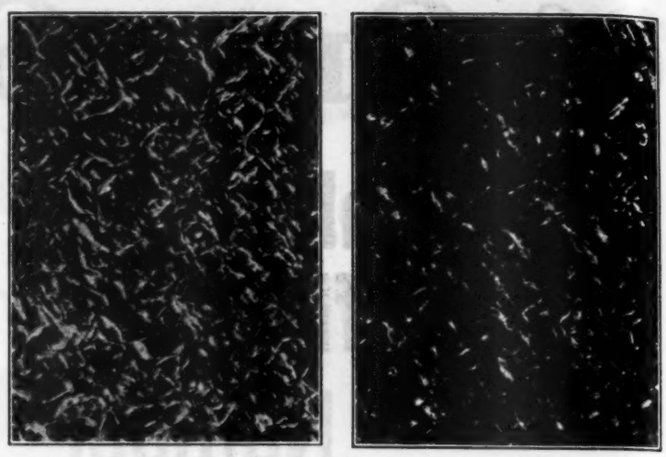
By L. C. Beard, Jr.
General Laboratories, Standard Oil Co. of New York

Pressure still tar, in the earlier days of cracking, was looked upon as a waste product and was largely disposed of as bunker fuel. Even today the larger percentage of tar finds its way into fuel oil. However, new uses are being found for this product and new methods of disposing of it are being developed. Generally, these newer methods of utilizing pressure still tar have included running to coke or pitch to furnish pressure still charging stock, or reducing the tar to asphalt. In this paper data will be presented which indicate that in many respects pressure still tar resembles an asphaltic base crude containing no gasoline or kerosene, and that by vacuum distillation and other suitable methods of refining, it is possible to obtain pressure still charging stock, lubricating oil, asphalt, pitch and coke therefrom. Some indication will be given of the yield and quality of products to be expected in each case. In Table 1 we give comparative tests on the pressure still tars referred to in this paper.



The above photomicrographs were taken of a cut representing the portion of the crude distilling overhead as the 56 to 80 per cent fraction. The photomicrograph on the left shows the overhead fraction from pressure still tar after being treated by the Edeleanu process. This represents a magnification of 100X. The oil has a pourpoint of 65° F. and a crystallization point of 66° F. On the right is shown the effect of liquid sulphur dioxide extraction on the crystallization characteristics of paraffin wax in the distillate from the pressure still tar. Magnification 100X, pourpoint 35° F., and crystallization point 50° F.

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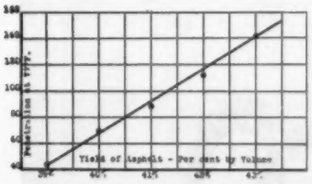
Pressure Still Charging Stock

The pressure still charging stock obtained from tar is not the equal of virgin gas oil and requires to be cracked at a higher temperature in order to produce the same yields of gasoline on a single pass through a cracking unit. When cracked at the same temperature the yields of gasoline are lower and the losses greater than for virgin stocks. In Table 2 we give a comparison of the yields, losses, octane numbers, etc., obtained from cracking distillates from various pressure



still tars and corresponding data for the stocks from which the tars were obtained. The cracking operations were carried out in a pressure cracking bomb under comparable conditions.

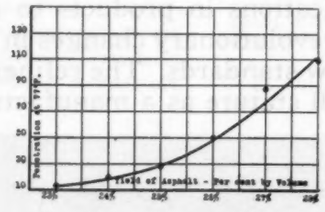
The data given in Table 2 lead to some very interesting conclusions. It will be noted that the losses, coke and gas formed on cracking were much higher for the distillates from pressure still tar than for virgin stocks. It will also be observed, in the case of the Mid-Continent stocks, that the octane number of the gasoline obtained on cracking an 80 per cent overhead distillate from pressure still tar was much lower than that for gasoline, obtained by cracking virgin gas oil. When a 50 per cent overhead from tar was cracked, however, a gasoline of much higher octane number was obtained, approximating that of the gasoline from virgin gas oil. This point should be remembered in connection with the discussion which follows on lubricating oil from pressure still tar; for it is the cut from 50 to 80 per cent overhead which contains most of the lubricating oil, and it is this cut which lowers the octane number of the gasoline, if it is included in the pressure still charging stock.

In the case of the Luling stocks, the yields are lower and the gas losses higher for the distillates from pressure still tar, when cracked under corresponding conditions, than those obtained from cracking the topped Luling crude. The coke formation, however, is higher in the latter case because comparison is made between cracking a residuum and a distillate. The octane number of the gasoline from cracking the tar distillate is slightly higher than that obtained from cracking the topped crude if they are both cracked for approximately the same yields.

In general then, it can be said that if distillates from pressure still tar are cracked at the same temperature as the virgin stocks from which the tars are obtained, the yields are lower and the gas formation and cracking losses higher for the tar distillates than for the virgin stocks. In order to crack tar distillates for the same yields of gasoline as the virgin stocks, higher temperatures are required and the losses are correspondingly higher.

In the case of some tars, the depth of the overhead cut which is cracked influences the octane number. With tar from Cross recirculating units operating on Mid-Continent crude an 80 per cent overhead cut gave gasolines of 54 to 57 octane number and a 50 per cent cut gave a gasoline of 61 octane number. For the Luling stocks, the octane numbers of gasolines from cracking a 50 per cent overhead cut from Luling tar and from cracking the topped crude were approximately the same—65.

If pressure still tar is vacuum distilled, about 86 per cent, in the case of tar from Cross recirculating units operating on Mid-Continent crude comes over at a vapor temperature of 150° to 500° F. At



the beginning of the distillation the distillate has the appearance of gas oil and maintains this character until about 50 per cent has been taken overhead. Beyond this point the distillate shows considerable viscosity and the cut from 55 to 80 per cent has all the appearance of lubricating oil. The cut from 80 to 86 per cent resembles filtered cylinder stock except that it is rather sticky in character. The residue left in the still is a brittle pitch.

The cut from 56 to 80 per cent, inclusive, obtained by vacuum distillation, as described above, had the tests shown in Table 3.

TABLE 3—TESTS ON 56-80 PER CENT, INCLUSIVE, CUT FROM PRESSURE STILL TAR

Approximate Distillation Temperature at 5 mm.—384°-470° F.	
Gravity, A.P.I.	10.3°
Flash, C.O.C.	445° F.
Fire, C.O.C.	520° F.
Pourpoint	35° F.
Viscosity, Saybolt at 100° F.	1,032"
Viscosity, Saybolt at 130° F.	343"
Viscosity, Saybolt at 210° F.	65"
Viscosity index	Minus 12
Color	Dark green
Conradson carbon	1.56%
Sulphur	0.79%

As will be noted from the above tests, a curious feature of this oil is its low viscosity index and high pourpoint, indicating that it contains both paraffinic and naphthenic constituents.

Edeleanu Process

The low viscosity index and oxidation instability of the above oil render it unsuitable for lubrication of any but the crudest type of machinery. In order to improve this oil it was treated by the Edeleanu process. The treatment was carried out at a temperature of 16° F., using four extractions with liquid sulphur dioxide, each time in amount equal to 50 per cent by volume of the oil being treated. The oil separated very well during the treatment and no difficulties whatsoever were experienced. The following yields were obtained:

Refined lubricating oil	40%
Extract	60%

In Table 4 we give comparative tests on the refined lubricating oil (Raffinade), on the extract, and on the oil before treatment.

The above figures are very interesting

TABLE 1—TESTS ON VARIOUS PRESSURE STILL TARS

Nature—	Tar from cracking Luling crude in Cross unit	Tar from cracking Mid-Cont. gas oil in Cross unit	Tar from cracking Mid-Cont. gas oil in DeFlores unit
Gravity A.P.I.	12.0°	11.2°	10.8°
Flash, COC	220°F.	305°F.	300°F.
Visc. Say., 130°F.	222"	104"	192"
Pourpoint	Below 0°F.	Below 0°F.	Below 0°F.
Water and sed.	2.8%	0.05%	0.7%
Sediment by ext.	0.46%	0.04%	0.17%
Carbon residue	10.3%	6.3%	10.6%

Distillation:	Temp.	Grav.	Temp.	Grav.	Temp.	Grav.
Start	293°F.	....	506°F.	....	387°F.	....
10%	531	31.1°	588	18.6°	589	32.7°
20%	589	23.3	617	18.0	631	25.3
30%	628	20.3	642	17.6	659	22.2
40%	663	19.5	660	17.3	676	19 9
50%	677	19.3	674	16.7	685	18.2
60%	682	20.1	688	15.9	690	17.0
70%	674	19.9	696	15.1	695	15.3
80%	585	20.4	706	13.6	568	8.5
90%	...	....	709	9.3	...	....
Final	684	....	709	....	703	....
Recovery	85%		92%		84%	
Coke from distillation	14.6% by wgt.		9.2% by wgt.		16% by wgt.	

TABLE 2—COMPARISON OF YIELDS, LOSSES, AND OCTANE NUMBERS OF GASOLINES OBTAINED FROM CRACKING DISTILLATES FROM PRESSURE STILL TAR AND FROM VIRGIN STOCKS

Stock—	Yield of gasoline of 400° FBP.	% off at 315°F. of the 400° FBP. gasoline	Octane number of 400° FBP. gasoline	Cracking loss	Coke lbs./42-gal. bbl.	Gas cu. ft./42-gal. bbl.	Highest cracking temperature
Stocks from Mid-Continent Crude							
56% Ovhd. by vacuum dist. of P.S. tar from Cross recirculating unit	22%	31½%	54	5%	1.3	192	820°F.
80% Ovhd. by vacuum dist. of P.S. tar from Cross recirculating units	36%	36%	57	19%	12.0	188(?)	875°F.
50% Ovhd. by vacuum dist. of P.S. tar from Cross recirculating units	23%	33½%	61	8%	1.1	155	850°F.
Virgin Mid-Continent gas oil from the cracking of which the above tars were obtained	25%	33%	62	1.7%	0.6	33	850°F.
Stocks from Luling Crude							
59% Ovhd. by vacuum dist. of P.S. tar from Luling crude	23½%	31½%	65	10%	1.5	327	855°F.
Topped Luling crude from the cracking of which the above tar was obtained	34%	28%	66	5.5%	12.7	276	835°F.
Topped Luling crude from the cracking of which the above tar was obtained	28%	26%	63	4.3%	4.5	171	820°F.

and show the marked improvement which, in the case of some stocks, it is possible to accomplish by the use of the Edeleanu process. Attention is called to the following effects produced by this treatment: The A.P.I. gravity of the oil was raised 11 points; the viscosity index was raised 83 points; the pourpoint was raised 30° F.; the Conradson carbon was reduced to 16 per cent and the sulphur to 60 per cent of the values for the untreated oil. The color was improved from a dark opaque green to a dark 8.

The increase in the pourpoint, due to the concentration of paraffinic constituents and to the removal of crystallization inhibiting asphaltic matters, is of interest. In the accompanying microphotographs is shown the effect of the Edeleanu treatment on the crystal structure of the wax. The wax in the treated oil is believed to be of a pressable character.

The Edeleanu refined oil was diluted with ethylene dichloride, chilled and filtered to remove the wax. This method of dewaxing was used because there was insufficient sample for dewaxing by filter press methods. The dewaxed oil after volatilization of the ethylene dichloride was finally treated with contact clay. The tests on the finished oil are given in Table 5.

TABLE 5—TESTS ON FINISHED LUBRICATING OIL FROM PRESSURE STILL TAR

Gravity, A.P.I.	20.5°
Flash, C.O.C.	435° F.
Fire, C.O.C.	510° F.
Pourpoint	5° F.
Viscosity, Saybolt, 100° F.	380″
Viscosity, Saybolt, 130° F.	167″
Viscosity, Saybolt, 210° F.	53″
Color	Light 6
Viscosity index	66
Conradson carbon	0.20%
Sulphur	0.45%

In the dewaxing about 3 per cent, based on the treated lubricating oil distillate, of 130° F. melting point wax was obtained. The following are the yields, based on the pressure still tar, of various products which can be obtained: Crude lubricating oil distillate, 25 per cent, from which by Edeleanu treatment there is obtained Edeleanu refined lubricating oil, 10 per cent; Edeleanu extract, 15 per cent. The Edeleanu refined lubricating oil on dewaxing gives: Finished dewaxed lubricating oil, 9.7 per cent · paraffin wax (130° F. melting point), 0.3 per cent.

From the above data it is seen that it is possible to obtain 9 to 10 per cent of lubricating oil of 167″ Saybolt viscosity at 130° F. from pressure still tar. This oil has a viscosity index of 66 and its other characteristics are such as to indicate that it would be a satisfactory oil for many purposes.

By the simple vacuum distillation of pressure still tar an oil of exceedingly low viscosity index can be obtained. In one instance an oil of the following characteristics was obtained:

Viscosity, Saybolt at 100° F.	6,000″ (approx.)
Viscosity, Saybolt at 130° F.	1,209″
Viscosity, Saybolt at 210° F.	102″
Viscosity index	Minus 200 (approx.)

This oil was obtained by making a deeper cut into the tar than in the case of the distillate which was given the Edeleanu treatment; apparently the deeper the cut, the lower the viscosity index.

If ever the need arises for an oil of exceedingly low viscosity index and with a specific gravity approaching that of water, we have here a source of such material.

Asphalt

While the manufacture of asphalt from pressure still tar is not novel, yet it was thought to be a matter of some interest to consider the quality and yields of asphalts and binders which can be produced therefrom.

TABLE 6—YIELD-PENETRATION DATA

De Florez tar		Cross tar	
Yield of bottoms % of tar charged by volume	Penetration at 77° F.	Yield of bottoms % of tar charged by volume	Penetration at 77° F.
39%	43	23%	12
40	69	24	20
41	88	25	29
42	113	26	51
43	141	27	88
..	...	28	108

TABLE 4—TESTS ON THE REFINED LUBRICATING OIL AND ON THE EXTRACT FROM THE EDELEANU TREATMENT OF A 56-80 PER CENT, INCLUSIVE, CUT FROM PRESSURE STILL TAR

	Refined oil	Extract	Before treating
Gravity, A.P.I.	21.3°	Below 10° (Sp. gr. 1.04)	10.3°
Flash, C.O.C.	425° F.	.....	445° F.
Fire, C.O.C.	490° F.	.....	520° F.
Pourpoint	65° F.	.....	35° F.
Viscosity, Saybolt at 100° F.	347″	8,500″ (approx.)	1,032″
Viscosity, Saybolt at 130° F.	160″	1,454″	343″
Viscosity, Saybolt at 210° F.	52″	101″	65″
Viscosity index	71	Minus 300 (approx.)	Minus 12
Color	Dk. 8	Dk. brown	Dk. green
Conradson carbon	0.25%	.....	1.56%
Sulphur	0.48%	0.96%	0.79%

TABLE 7—TESTS ON ASPHALTS OBTAINED BY VACUUM DISTILLATION OF CROSS AND DE FLOREZ PRESSURE STILL TAR FROM CRACKING MID-CONTINENT GAS OIL

	100-110 penetration		85-100 penetration		50-65 penetration	
	De Florez tar	Cross tar	De Florez tar	Cross tar	De Florez tar	Cross tar
Specific gravity, 77° F.	1.085	1.075	1.088	1.076	1.090	1.082
Penetration, 77° F.	112	108	88	88	59	51
Evaporation loss	0.06%	0.07%	0.04%	0.09%	0.03%	0.09%
Penetration of residue after evaporation (% of original penetration	87%	76%	86%	76%	....	....
Solubility in carbon bisulphide	99.8%	99.9%	99.7%	99.9%	99.7%	99.9%
Fixed carbon	15.6%	11.6%	15.9%	11.9%	16.3%	12.4%
Flash, C.O.C.	495° F.	495° F.	495° F.	500° F.	500° F.	525° F.
Ductility, 77° F.	116	140	112	140	140	140
Melting point (R. & B.)	...	...	107° F.	109° F.	109° F.	116° F.

De Florez and Cross pressure still tar from Mid-Continent gas oil were distilled at 4 mm. In Table 6 it is indicated how the yield of bottoms changed with the penetration thereof. These data are shown graphically in the accompanying curves.

Complete tests were obtained on those samples which were 100-110, 85-100 and 50-65 penetration and are given in Table 7.

As will be noted from the data given in Table 7 a good quality asphalt can be manufactured from pressure still tar which will satisfactorily meet many state and municipal specifications. The outstanding difference between asphalts made from pressure still tar and from Mexican and Venezuelan crudes is that the melting points of the asphalts from pressure still tar are about 10° F. lower than Mexican and Venezuelan asphalts of the same penetration.

Pitch and Coke

By running pressure still tar to coke approximately the following yields of pressure still charging stock can be obtained from various tars:

Nature of tar—	% Stock
De Florez, Mid-Continent gas oil	84% approx.
Cross, Mid-Continent gas oil	92%
Cross-Luling crude	86%

The coke obtained by coking pressure still tar in the usual methods—running to coke in a shell still or coking in a drum connected to the cracking unit—has a relatively high content of volatile matter and lacks the structure necessary in a domestic fuel.

The Universal Oil Products Co., at the meeting of the National Petroleum Association in September of last year, reported on some work which they have been doing to produce a low volatile coke of good structure by coking Dubbs' tar outside of the cracking zone. Briefly this process is as follows:

A rotating cylindrical tube of special alloy, approximately 30 feet long by 6 feet in diameter, set at a slight angle is provided for a 1,000-bbl. unit and arranged so that it can be externally heated. The hot tar from the tar line is led by means of a pipe into the end of the rotating tube. The slow rotation of the retort which is set at an angle permits the residue to spread over the inner surface, distillation to coke being accomplished as it travels along the retort.

Coke gradually builds up on the inside surface of the rotating retort and is allowed to accumulate to a thickness of from 2 to 3 inches before it is discharged. When this thickness of coke is reached, the fires are cut from under the retort and the coke immediately begins to crack off and discharge. The difference in the coefficients of expansion of the coke and the retort probably accounts for the coke cracking out in the manner described.

During the coking period the vapors arising from the retort are fractionated into a light liquid product which is returned to the cracking unit and a residuum which is returned to the retort. The light liquid overhead of 20° A.P.I. gravity contains about 25 per cent of 437° F. boiling point gasoline having an octane number of 86 to 93. As an example of the yields obtainable, in one case 30 per cent of coke, 30 per cent gas and loss and 40 per cent liquid overhead of 20° A.P.I. gravity were obtained. Approximately 1,000 cubic feet per barrel of residue treated is the average gas production, which has a calorific value of around 1,000 B.t.u. per cubic foot. This is in excess of what is required to sustain the operation from a heat requirement point of view.

The coke is said to contain less than 5 per cent of volatile matter and to have a structure and properties which render it suitable for a smokeless domestic fuel.

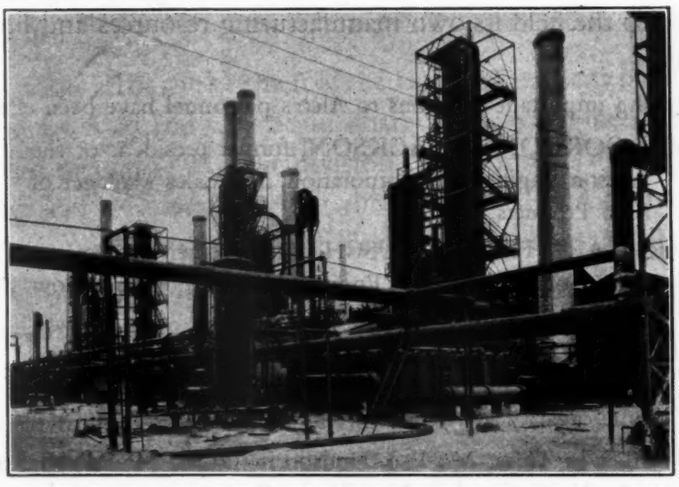
Knowles Process

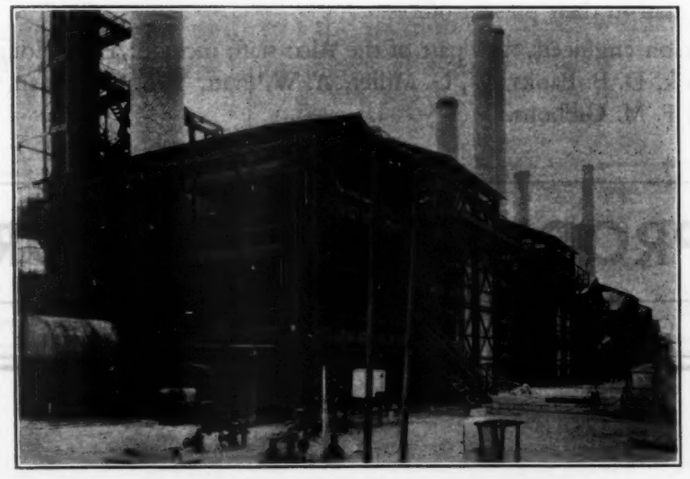
Another system comparable to the above, being one wherein external heating is resorted to, is the Knowles process. Heavy residues are fed into a beehive type of oven, which is heated through a ceramic hearth by means of combustion flues built in the hearth. The residues are fed through the arched roof of the oven through an open pipe on the heated hearth. The vapors and gas liberated being withdrawn, fractionated, condensed and separated in the usual way. A thickness of 6 to 8 inches of coke is built up in this way on the oven floor. The discharging operation is brought about by raising self-sealing doors at each end of the oven and bringing an electrically operated ram into play, which pushes the coke off the hearth, much in the same manner as a coke oven is discharged.

If pressure still tar is run to an overhead somewhat in excess of that required to give asphalt, a hard brittle pitch is obtained. This material can be pulverized and burned in a powdered coal burner under the boilers. On account of the relatively low melting point preheated air cannot be used in the burners.

The foregoing discussion of pressure still tar we believe indicates in a general way how this product, at one time considered of little value, can be utilized to give valuable products for which there is a ready market for use in refinery operations.

BATTERY OF GULF COAST CRACKING STILLS





Views of Cross cracking stills in operation at Beaumont, Tex., refinery of the Magnolia Petroleum Co. Erected by M. W. Kellogg Co.

ALCO ACQUIRES BUSINESS OF

Announcement by ALCO

ALCO PRODUCTS · INCORPORATED, has acquired the business, goodwill, patents and essential personnel of the Jackson Engineering Corporation, of Tulsa, Oklahoma, designers and manufacturers of gasoline recovery and stabilization plants and other equipment for the gas and oil industries. This became effective as of March 1st.

As a result of this transaction, Alco has become engaged in the engineering, design and construction of the types of gasoline plants and equipment formerly engineered and designed by the Jackson Company, taking advantage of the technical experience of the Jackson group, and bringing into the field its own manufacturing resources and financial affiliations.

The following important additions to Alco's personnel have been effected:

MR. GORDON M. JACKSON, former president of the Jackson Engineering Corporation, now Sales Manager of Alco Products.

MR. KARL FINSTERBUSCH, former chief process engineer of the Jackson Engineering Corporation, now member of Alco technical staff.

MR. PAUL D. BARTON, formerly consulting engineer for Jackson Engineering Corporation, now retained in same capacity by Alco.

Mr. A. W. Burket in Tulsa, Mr. E. J. Hudson in Dallas, Mr. M. H. Roths in Chicago, and Mr. N. M. Floyd in New York all continue as members of the Alco sales staff in their present offices.

Other Jackson engineers, now part of the Alco staff, include: H. S. Houghton, A. T. Krook, D. B. Banks, W. G. Miller, A. W. Pratt, T. E. Casselman, H. C. Trich, and F. M. Gibbons.

ALCO PRODUCTS · INCORPORATED

DIVISION · OF · AMERICAN · LOCOMOTIVE · COMPANY

JACKSON ENGINEERING CORPORATION

Statement by GORDON M. JACKSON,

Former President of the Jackson Engineering Corporation

THE effect of the acquisition of the business of the Jackson Engineering Corporation by Alco Products · Incorporated, is to combine the experience of the Jackson group in engineering and designing gasoline plants with the financial strength and manufacturing facilities of Alco. It is a constructive step in every sense.

Practically all of the key men of the Jackson Company have been retained by Alco and will be in charge of the engineering and design in the gasoline plant division. The former Jackson engineering staff will be located at the main office of Alco and will continue under the direction of Karl Finsterbusch, with Paul D. Barton as consulting engineer. The field engineers will continue to operate as before.

In announcing the retirement from business of the Jackson Engineering Corporation, as such, I wish to express my appreciation to the former customers whose patronage was responsible for the company's success, and to voice the hope that their confidence in the integrity and ability of the Jackson engineers will continue to be reposed in them in their new affiliation.

MAIN OFFICE: *220 East 42d St., New York*

DISTRICT OFFICES: *McCormick Bldg., Chicago; Terminal Tower Bldg., Cleveland; Magnolia Bldg., Dallas, Tex.; Esperson Bldg., Houston, Tex.; Barr Bldg., Washington, D. C.; Philtower Bldg., Tulsa, Okla.; Rialto Bldg., San Francisco, Cal.*

PLANTS: Dunkirk, N. Y.; Montreal, Canada · *Cable Address:* Alproducts

FOREIGN ASSOCIATES: S. A. Alco Products International, *170 Rue Faubourg St. Honore, Paris, France.* Montreal Locomotive Works, Limited, *Montreal, Canada.* American Locomotive Sales Corporation, *25 Victoria Street, London, S. W. 1, England.*

Refiners Expand Cracking Facilities

Annual Survey Shows Continued Growth Over Past Year. Has Become Most Important Phase of Plant Operation.

By C. O. Willson

The continued expansion of cracking facilities, the construction of a number of small local plants and a decrease in the total number of operating refineries are the principal developments of the past year as shown in The Oil and Gas Journal's 1932 Survey of Petroleum Refineries in United States.

Petroleum refiners have steadily expanded their cracking plants since the art of high pressure and high temperature distillation of heavy crude oil fractions became a commercial phase of refinery operation and this trend continued over the past year despite the generally unfavorable situation in the petroleum industry. In March one or more cracking units were in operation at 191 refineries in United States and the total capacity of these units totaled 1,954,550 bbls. daily. This was an increase of 109,941 bbls. daily in cracking capacity over March of last year and approximately double the 1926 figure.

This increase materialized although the number of operating refineries with cracking plants decreased from 208 to 191 during the year. Due to unfavorable market conditions a number of refineries which had been in operation for several years were shut down and among this number were several refineries with cracking equipment.

ARRANGE 1932 SURVEY IN CONVENIENT FORM

This year's annual survey of Petroleum Refineries in United States and Canada which is published complete in this issue has been arranged so as to be more convenient for reference than in previous years. The data for United States are divided in two parts.

The first part starting on this page gives the complete personnel of companies and refinery locations arranged in alphabetical order without regard to states.

The second part, starting on opposite page, gives complete data on operations by states.

Similar data covering Canadian operations will be found on page 64.

RECAPITULATION

TABLE 1—GROWTH IN PETROLEUM REFINING (1914-1932)

Year—	Total number of refineries	Total crude capacity bbls. daily	Number of operating refineries	Capacity operating refineries bbls. daily	Number refineries with cracking process*	Cracking capacities bbls. daily
1914	176	.....	...	.....	...	.....
1918	267	1,186,155	...	.....	...	.....
1919	289	1,295,115	...	.....	...	.....
1920	373	1,530,565	...	.....	...	.....
1921	415	1,888,800	...	.....	...	.....
1922	479	2,164,050	325	1,854,590	...	.....
1924	574	3,046,790	362	2,549,490	...	.....
1925	584	3,033,682	385	2,680,052	(†)	(†)
1926	515	3,068,340	356	2,770,340	150	980,960
1927	462	3,224,307	328	2,964,427	158	1,245,890
1928	456	3,426,330	315	3,116,930	148	1,327,584
1929	463	3,719,550	341	3,454,250	170	1,487,950
1930	479	3,972,460	362	3,721,360	186	1,705,299
1931	500	4,164,080	307	3,913,180	208	1,844,609
1932	510	4,093,370	383	3,665,830	191	1,954,550

*Operating refineries only. †Not available previous to 1926. Note: The reports from 1924-1932, inclusive, were compiled by The Oil and Gas Journal and the remainder by government bureaus.

Cracking Expands

The data giving cracking capacity only partially reflect the actual growth in that phase of refinery operation. The Bureau of Mines report on production of cracked gasoline over five years is as follows:

Year—	Bbls. output
1927	101,226,000
1928	122,554,000
1929	143,727,000
1930	164,243,000
1931	176,181,000

In contrast to this upward trend in cracked gasoline production, the straight-run gasoline output of these same refineries materially decreased as shown in the following table:

Year—	Bbls. output
1927	197,047,000
1928	219,168,000
1929	244,894,000
1930	225,304,000
1931	220,262,000

Thus, while the production of straight-run gasoline in 1931 decreased 24,631,000 bbls. from the peak of 1929, cracked gasoline increased 32,454,000 bbls.

Practically every development of the past year in the oil business has emphasized the desirability of increasing cracking capacities. The demoralized markets of the past year, largely a reflection of an unsettled crude oil situation, brought the lowest prices for refined products in the history of the industry. These low prices included the heavy fractions of crude oil obtained in the topping or skimming operations. These fractions are usually sold as fuel for marine, industrial and public utility consumption. The same situation applied to gas oil. This demand was greatly reduced over the past year and most refiners have had excess material on hand. They have had the choice of selling it at ruinous prices or adding cracking equipment to manufacture it into gasoline. Many have chosen the latter course.

Although the demand and prices received for residual oils and heavy overhead oils will no doubt improve with a return to more normal business conditions, there are many within the refining industry who believe that the competition of cheap coal and gas will keep the fuel oil prices below their value as raw material in the manufacture of motor fuels. For that reason they are rounding their cracking facilities so as to reduce the quantity of heavy oils which they will have to market in the future.

Another angle to this development over the past year was the increasing number of refiners who changed their cracking operations so that coke instead of low gravity fuel oil was the residual product of the operation. In general this method of operation tends to increase the yield of gasoline from the cracking stock.

Marketing Developments

Marketing developments also added to the attractiveness of cracking operations and were responsible for the expansion of several refineries including construction work now under way and that which will be built before the end of the year. Marketing departments of both small and large companies are calling for a greater production of antiknock gasoline and additional cracking is the answer to this request. So far as skimming operations are concerned, refinery operators are definitely limited as to the octane rating of their finished motor fuels. By close control of fractionation and the production of lower endpoint gasolines, the skimming plant operators have been able to make some improvement in the antiknock quality of their gasoline as measured in octane. However, this accomplishment is of minor significance when compared with the flexibility obtainable in the modern cracking plant. The aim of most refiners over the past year has been to increase the octane rating of their cracked gasoline even at the sacrifice of the percentage yield from the cracking stock and remarkable results have been obtained which have contributed materially to the desirability of providing for maximum capacity.

The designers and builders of cracking equipment must also be given their due share of credit in adding to the attractiveness of cracking operations. The up-to-date unit differs in capacity, yields and general efficiency from the pioneer cracking still of a few years ago as does the modern crude oil pipe still from the shell stills. Improved furnace design, better metals to withstand high pressures and temperatures, wider use of heat exchange, efficient fractionation and automatic control as developed by manufacturers with the assistance of refinery operators, has given the refining industry greater yields of finished products at greatly reduced costs.

Reforming Units

In addition to heavy oils cracking is being expanded to include the lighter

Personnel of Operating Refineries in United States

ABBREVIATIONS USED IN DATA ON PERSONNEL

President, pres.; vice president, v. p.; secretary, sec.; treasurer, treas.; general manager, g. m.; superintendent of refineries, supt.; sales manager, s. m.; chief engineer, c. e.; chief chemist, c. c.; purchasing agent, p. a.

Mailing Address

With the exception of plant superintendents, chief engineers, and chief chemists the mailing address of the company personnel listed in this report usually is the general office of the company.

ABBREVIATIONS USED IN OPERATING DATA

Complete plant (Comp.)—Gasoline, kerosene, gas oil, fuel oil, lubricating oils, paraffin wax, petroleum coke, asphalt or both coke and asphalt, usually includes cracking. Some plants listed as complete do not manufacture asphalt or coke.

A

Aetna Oil Service, Inc., 1202 South Third St., Louisville, Ky. Curtis W. Webb, pres.; H. R. Abbott, v. p., treas. and g. m.; W. T. Davis, sec. and supt.; E. E. Van Buren, asst. supt.; G. B. Johnston, s. m.; Ryan B. Marrs, s. m. (bulk stations); W. T. Davis, c. e.; E. E. Van Buren. Refinery located at Louisville, Ky.

Allegheny-Arrow Oil Co., Gambrinus Ave., Canton, Ohio. Edward Reiser, pres. and g. m.; William Thompson, v. p.; Earl V. Bartchy, sec. and treas.; Reed Brazil, asst. supt., Canton, Ohio. Refinery located at Canton, Ohio.

Allstate Refining Co., Thrall, Tex. H. H. Coffield, pres.; George P. Mann, v. p.; J. H. Edwards, sec., treas. and g. m.; George P. Mann, gen. supt. of ref.; George P. Mann, supt., L. E. Palmer, asst. supt., Thrall, Tex.; C. A. Middleton, s. m. (tank car). Refinery located at Thrall, Tex.

Altitude Petroleum Corp., Kennedy Bldg., Tulsa, Okla. I. Arthur Anson, pres.; M. Lloyd Freese, v. p.; C. H. Warner, Jr., sec.; R. Wyman, treas.; M. Lloyd Freese, gen. supt. of ref. R. W. Lind, supt., Chanute, Kans.; J. A. Peacock, supt., Oklahoma City, Okla.; C. H. Warner, Jr., s. m. (tank car); H. C. Jenkins, p. a. Refineries located at Oklahoma City, Okla., and Chanute, Kans.

American Petroleum Co., Petroleum Bldg., Houston, Tex. W. W. Moore, Jr., pres.; R. C. Tucker, James P. Lavery, v. p.; G. L. Townsan, sec.; C. T. Carnes, treas.; R. C. Cook, supt., Norsworthy, Tex.; James P. Lavery, s. m. (tank car and bulk stations); John H. Bringhurst, c. e.; H. P. Sellers, c. c.; J. R. McClarty, p. a. Refinery located at Norsworthy, Tex.

American Refining Properties, Wichita Falls, Tex. (Operating under Declaration of Trust). W. L. Scott, m. oil and ref. div.; A. W. King, m. real estate div.; G. O. Kinnard, supt., Wichita Falls, Tex.; W. L. Scott, s. m. (tank car); R. C. Rockwell, s. m. (bulk stations); J. C. Williams, c. e.; R. E. Goode, c. c.; H. W. Yeaker, p. a. Refinery located at Wichita Falls, Tex.

Anderson-Prichard Oil Corp., 711 Colcord Bldg., Oklahoma City, Okla. L. H. Prichard, pres.; J. Steve Anderson, v. p.; P. H. Anderson, sec. and treas.; George H. Burruss, gen. supt. of ref.; M. B. Burruss, supt., Cyril, Okla.; C. L. Mayhall, s. m. (tank car); C. H. Dresser, s. m. (bulk stations); W. M. Sturges, p. a. Refinery located at Cyril, Okla.

William P. Andrews Oil Co., 219 Pacific Southern Bldg., Long Beach, Calif. William P. Andrews, pres. and g. m.; G. M. Andrews, v. p.; J. O. Moffett, sec. and treas.; William A. Kirk, gen. supt.; C. S. Cox, supt., Long Beach, Calif.; W. D. Parks, supt, Newhall, Calif.; J. O. Moffett, s. m. (tank car and bulk stations); W. A. Kirk, c. e.; E. A. Erinson, p. a. Refineries at Long Beach and Newhall, Calif.

(Continued on Page 103)

actions of crude stills. The so-called reforming" units for cracking straight-in gasoline, naphtha and kerosene cuts e being used by several refiners. The ain purpose of this operation is to take e gasoline or naphtha cuts which are f low antiknock rating and by reforming cure a premium motor fuel. The fact at this operation which involves heavy s losses plus additional operating arge is being used during a period of ceptionally low gasoline prices indicates e important place that antiknock rat-g has obtained in the refining industry.

Other Uses for Cracking

The place that cracking has in refinery eration does not rest entirely on the ility to produce the best grades of mo-r fuels. Development work of the past ar shows that it has become the basic eration in the production of a number f additional products. Residual oils from acking are now being widely used in e production of road oil and asphalts. everal operators have found that they n more easily meet the varying specifi-tions of buyers through the use of the siduum of the cracking operations than ey could with the former methods of eration.

The hydrocarbon properties of the acked gasolines which are responsible r the better performance in engines are so being used in the production of other oducts. The cracking stills are furnish-g solvents, lacquers and other naphthas r a wide variety of industries. Greater xpansion is assured along these lines.

Even the gases from the cracking op-rations, not desirable in motor fuels, are onstantly finding new uses. The demand r liquefied butane and propane coming om the cracking operation is constant-expanding while hydrocarbons in the ases are being used in the production of lcohol and other specialties.

In brief, the art of refining has eached the stage where it should be onsidered from the standpoint of ca-acity to decompose the hydrocarbon onstituents found in crude oil by special istillation and chemical treatment so as o meet the more discriminating and ever idening consumer demand. Output and uality of finished products rather than rude oil capacity should be the yard-tick by which refinery operations should e measured in the future.

Local Plants

The past year has seen the construc-ion of a large number of small skim-ing plants located adjacent to a crude il supply. The excess of crude oil over he greater part of last year was re-ponsible for the construction of these lants. Unable to find outlets for their rude oil, many producers tried the ex-eriment of either building or sponsoring kimming plants of from 25 to 500 bbls. aily capacity. Usually discarded equip-ent was used and the total expenditures id not exceed a few thousand dollars.

TABLE 2—1932—REFINING CAPACITY IN THE UNITED STATES; RECAPITULATION BY STATES
(Capacities given in barrels daily)

State—	No. of plants	Daily crude capacities	Plants operating	Capacity operating plants	Shutdown plants	Capacity shutdown refineries	Operating plants with cracking facilities	Cracking capacities
Alabama	1	6,000	1	6,000	..	.....	1	3,500
Arizona	1	1,000	..	.....	1	1,000	..	.....
Arkansas	11	53,000	10	52,000	1	1,000	7	19,000
California	76	916,950	57	806,850	19	110,100	14	200,300
Colorado	5	5,800	5	5,800	..	.....	3	3,800
Georgia	2	9,000	2	9,000	..	.....	1	3,600
Illinois	13	135,400	10	128,700	3	6,700	8	83,100
Indiana	7	175,100	5	172,000	2	3,100	5	123,000
Iowa	1	1,500	..	.....	1	1,500	..	.....
Kansas	19	158,000	15	140,500	4	17,500	14	85,200
Kentucky	14	35,700	10	26,800	4	8,950	6	12,200
Louisiana	16	242,700	12	198,900	4	43,800	6	68,200
Maryland	4	57,000	3	50,000	1	7,000	2	68,000
Massachusetts	2	48,000	2	48,000	..	.....	2	30,300
Michigan	6	17,500	4	14,000	2	3,500	1	3,600
Missouri	2	19,500	2	19,500	..	.....	2	16,000
Montana	21	33,400	16	23,950	5	9,450	2	3,800
New Jersey	9	314,000	9	314,000	..	.....	7	242,000
New Mexico	9	8,550	6	4,250	3	4,300	..	.....
New York	4	40,500	4	40,500	..	.....	4	18,000
Ohio	17	103,530	15	101,530	2	2,000	10	49,750
Oklahoma	61	349,600	41	292,700	20	56,900	26	113,100
Pennsylvania	48	250,100	40	239,100	8	11,000	15	115,400
Rhode Island	2	11,500	2	11,500	..	.....	1	6,000
South Carolina	1	15,000	1	15,000	..	.....	1	20,500
Tennessee	2	1,000	..	.....	2	1,000	..	.....
Texas	128	977,850	89	845,700	39	132,150	40	594,000
Utah	3	8,000	3	8,000	..	.....	1	8,900
Virginia	1	1,500	1	1,500	..	.....	..	.....
Washington	2	1,500	..	.....	2	1,500	..	.....
West Virginia	6	22,000	6	16,000	..	.....	5	23,950
Wyoming	16	79,100	12	74,050	4	5,140	7	42,850
Total	510	4,003,370	383	3,665,830	127	427,540	191	1,954,550

These plants provided outlets for crude oil which otherwise would have stayed in the ground or have been sold at distress prices.

Most of these plants were built in California, Wyoming, Texas and Kentucky. In addition several plants of greater capacity were built in these States with the expectation that they will be operated for several years. Small pools located some distance from major pipe line connections furnished the supply of crude for many of the small plants. The products are usually sold at the plant or moved by tank wagon to local consumers.

It is certain that these small plants for the most part are temporary factors in the refining business. The cheap source of crude supply will end when an equilibrium is reached between supply and demand. The cost of operating these plants is relatively high under normal conditions. In addition as previously explained these plants do not have the equipment to manufacture the quality products required by most consumers.

The building of these small plants and half dozen refineries during the past year did not prevent a decline in the number of operating refineries. The total number of operating refineries in United States in March was 383 with a total capacity of 3,665,830 bbls. daily. Crude oil runs to stills have been averaging around 2,100,000 bbls. daily showing that present operations are about 60 per cent capacity. A year ago 397 refineries were in operation with a capacity of 3,913,190 bbls. daily. This year's figure includes several plants which were temporarily shut down in March. Where operators indicated that the shutdown of their plants was temporary and operations would be resumed in April, the plants are carried in the accompanying survey as operating plants.

A year ago 103 plants were listed as shut down with a capacity of 251,200 bbls. daily. This year, the number has jumped to 127 with a capacity of 427,540 bbls. daily. As usual this year's list carries a number of refineries which have little significance as potential refining capacity. In some cases the plants have been shut down more than 10 years and in many other cases over five years. It is practically certain that not one out of 25 of these plants will ever be operated again. If their owners should resume operations, the plants would have to be completely rehabilitated and if the owners decided to use only modern processing none of the old equipment would be used. Some of this old equipment was moved to new fields and used in the construction of the small local plants previously mentioned. A few plants which were dismantled during the past year were dropped from the list of shutdown plants.

Texas Leads

In the relative standing of the 32 states having one or more refineries there was little change over the past year. Alabama was added to the list of states due to the building of a 6,000-bbl. plant at Mobile by the Coastal Petroleum Co. This plant started to operate in February. It was the first refinery to be built in Alabama.

Texas easily retains its lead position in the refining industry. Although a number of plants were shut down during the past year, several were built and at present it has 89 operating refineries with a capacity of 845,700 bbls. daily, or approximately one-fourth of the entire United States. In cracking, 40 of its operating refineries have plants with a capacity of 594,000 bbls. daily.

Survey of Operating Refineries By States

kimming plants (S)—Gasoline, kerosene, gas oil and fuel oil.
kimming and lub (S&L)—Gasoline, kerosene, gas oil, fuel oil and lubricating oils.
kimming and asphalt (S&A)—Gasoline, kerosene, gas oil, fuel oil and asphalt.
kimming, lub and asphalt (SL&A)—Gasoline, kerosene, gas oil, fuel oil, lubricating oils and asphalt.
sphalt plant (A)—Distillates, gas oil, fuel oil and asphalt.

Topping plant (T)—Tops, distillates, gas oil and fuel oil.
Cracking (C)—Same products as skimming.
Lub plant (L)—Gas oil, fuel oil and lubricating oils.
Wax—No separate listing for wax is given in this year's survey. Refiners having lubricating plants in most cases manufacture wax.

ALABAMA

Company and plant location—	Crude oil cap.	Crack. cap.	Type of refinery	Type of cracking plant
oastal Pet. Corp., Mobile	6,000	3,500	S-C	Coffey

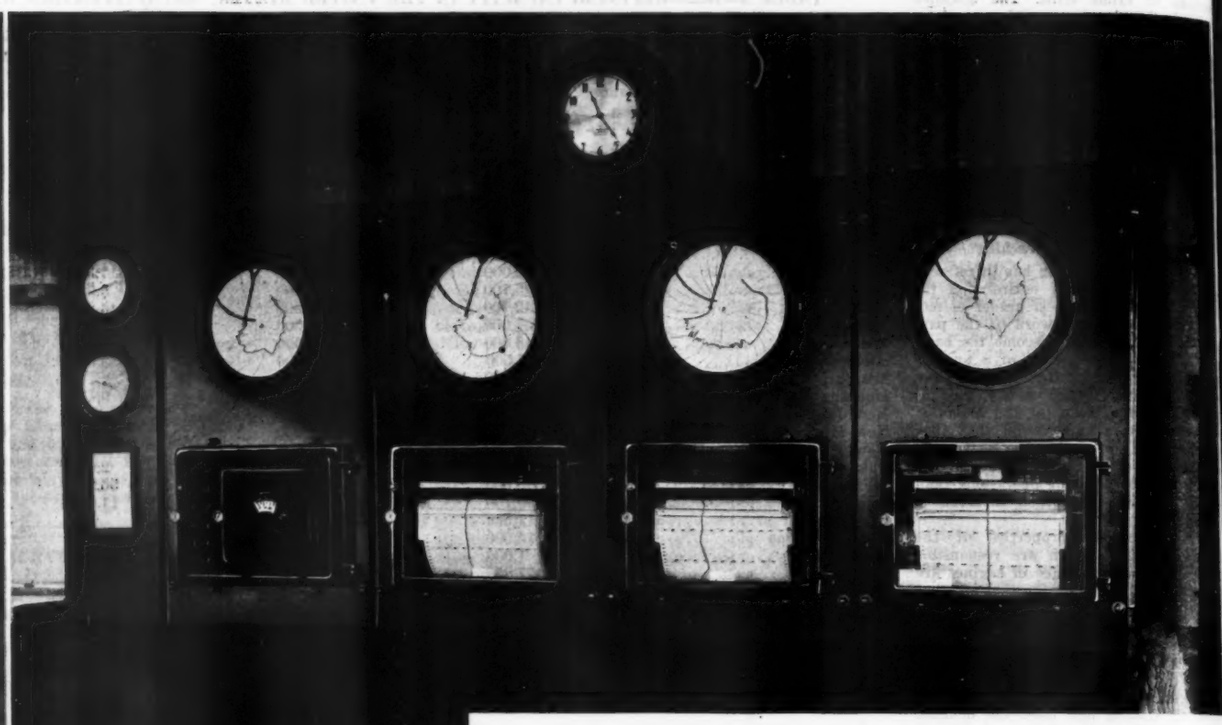
ARKANSAS

erry Asphalt Co., Waterloo	2,000	.....	A-L	
enry H. Cross Co., Smackover	4,000	.....	S	
ouston Oil Co., Camden	3,500	1,000	S-C	Dubbs
ettle Creek Ref. Co., El Dorado	5,000	2,000	S-C	Dubbs
ion Oil Ref. Co., El Dorado	12,000	6,000	S-C-A	Lion, Burton
acmillan Pet. Products Co., Norphlet	7,000	.....	S-L	
uachita Valley Ref. Co., El Dorado	2,000	1,000	S-C	Vapor phase
oot Ref. Co., El Dorado	12,000	5,000	S-C	Dubbs and Root
imms Oil Co., Smackover	2,500	2,000	S-C	Cross
nion Asphalt Co., El Dorado	2,000	2,000	S-C-A	Union
Total	52,000	19,000		

CALIFORNIA

Andrews, Wm. P., Oil Co., Long Beach	2,000	.....	S
Andrews, Wm. P., Oil Co., Newhall	2,000	.....	S-A
Associated Oil Co., Associated	58,000	10,000	Comp. Tube and Tank
Associated Oil Co., Wilmington	18,000	.....	S
Bush, R. R., Oil Co., Long Beach	3,000	.....	S
California Northern Oil Co., Coalinga	200	.....	L
Caminol Co., Ltd., Santa Fe Springs	1,000	.....	S
Capitol Crude Oil Co., Santa Paula	100	.....	S
Casmite Co., Casmalia	1,000	.....	A
Champion Gasoline Co., Long Beach	2,500	.....	S
Cherry Oil Co., Hynes	1,500	.....	S
Consolidated Pacific Ref. Co., Santa Fe Springs	1,000	.....	S
Edington Witz Ref. Co., Ltd., Long Beach	4,000	.....	S
Estado Pet. Corp., Ltd.	5,000	.....	S
Exeter Oil Co., Ltd., Long Beach	5,000	.....	S

(Continued on Page 114)



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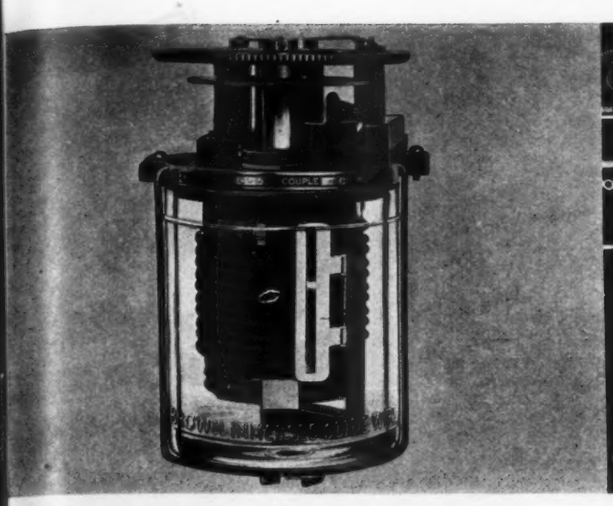
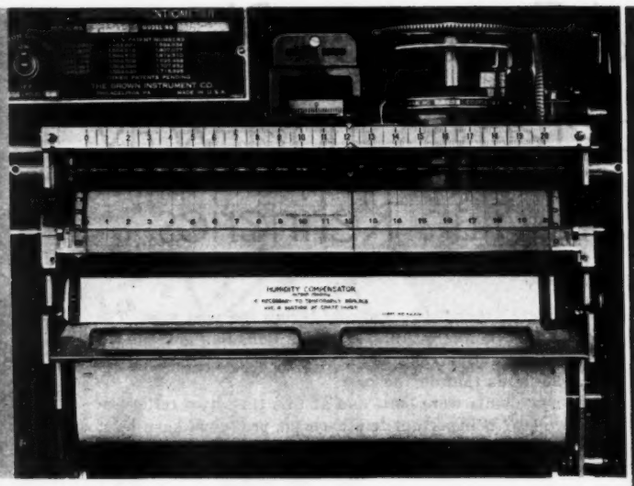
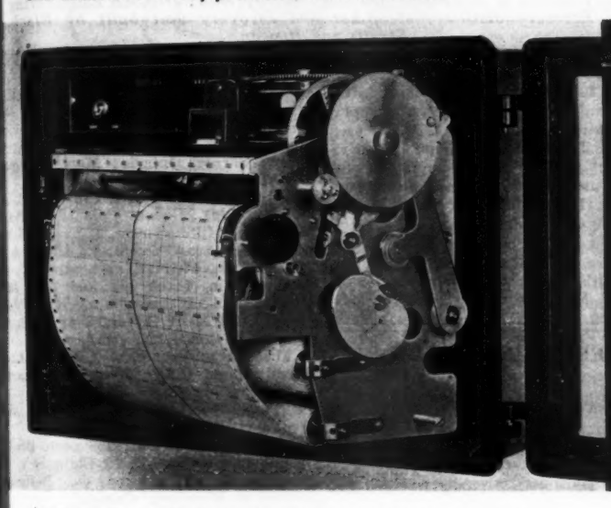


EXTRA LONG SLIDE WIRE—40 inches—and rheostat for standard cell balancing, enclosed in glass and immersed in oil, protected from corrosion.



HUMIDITY COMPENSATOR for chart. Automatically compensates for possible errors caused by paper expansion and contraction.



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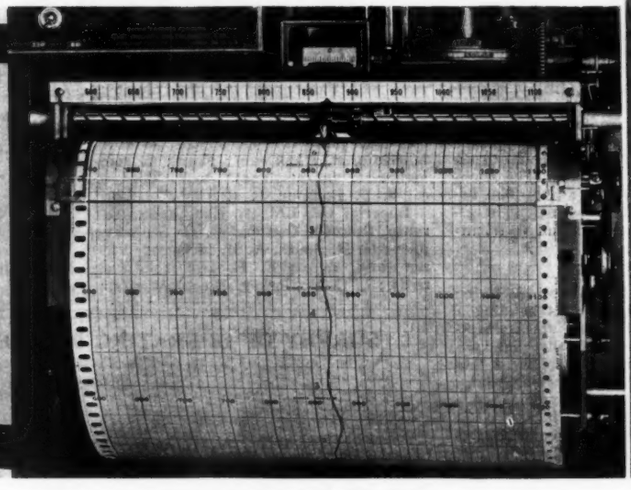

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Several Expansion Plans Completed or Under Way At Canadian Refineries

* * * * * *

Refinery operations rapidly expanded in Canada during the past year. The protection given refining and marketing operations by the Canadian government in the form of import taxes and antidumping laws, served to place refinery operations on a more favorable basis than in the past.

During the year four new plants were built and at this time, two refineries are under construction. In addition important improvement programs have been completed or are now under way at plants which have been in operation for several years. Bell Refining Co., Ltd., built a plant at Calgary, Alberta, with a crude oil capacity of 750 bbls. daily and a vapor phase cracking capacity of 500 bbls. The Radio Refineries, Inc., built and placed in operation a 1,000-bbl. skimming plant at Winnipeg, Manitoba. The Sterling Oil Refineries, Ltd., since the first of the year started operating a 2,000-bbl. refinery at Moose Jaw, Saskatchewan. This refinery has a 1,200-bbl. cracking plant designed and built by the company.

The most important addition to Canadian refinery capacity was the new refinery built at Montreal, Ontario, by the British American Oil Co., Ltd. The company for several years has operated a plant located at Toronto. The new refinery has a crude oil capacity of 8,000 bbls. daily with sufficient cracking to assure a well-balanced operation. The Montreal plant is located so as to take advantage of water transportation in receiving crude oil supplies and distributing refined products.

Plants Building

At this time, the Simrall Refining Corp. of Cincinnati, Ohio, is building a 2,500-bbl. skimming plant at Amherstburg, Ontario. The company has announced its intention to supplement this skimming operation with cracking equipment before the end of the year.

The Seaboard Oil & Refining Co. is clearing a site preparatory to building a plant at Vancouver, British Columbia. The company has been planning the construction of a plant for some time.

At Coutts, Alberta, the Northwest Stellarene Co., Inc., is building a 1,000-bbl. cracking plant of the Dubbs design. This will be placed in operation within a few weeks.

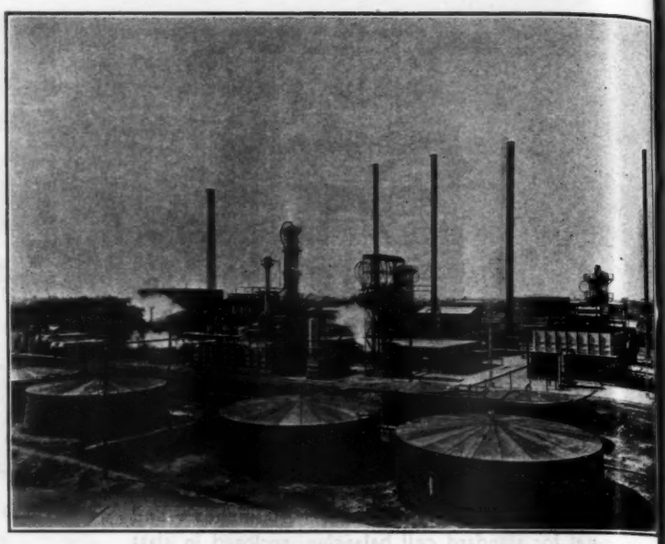
The nineteen refineries operating and under construction have a crude oil capacity of 148,950 bbls. daily. These refineries have cracking plants with a capacity of 69,200 bbls. daily. A year ago, the annual survey showed 16 plants operating with a crude oil capacity of 135,500 bbls. daily and a cracking capacity of 40,000 bbls. daily.

OPERATING PERSONNEL OF CANADIAN REFINERIES

Bell Refining Co., Ltd., 1202 First St., West, Calgary, Alberta. A. G. Spooner, pres.; R. A. Brown, v. p.; George A. Barber, sec. and treas.; Floyd J. Huff, g. m. and g. m. of ref.; M. T. Stevens, supt., Manchester, Calgary. Refinery located at Calgary, Alberta.

British American Oil Refineries, Ltd., Royal Bank Bldg., King and Yonge Sts., Toronto, Canada. A. L. Ellsworth, pres.; S. R. Parsons, v. p.; P. W. Binns, sec.; J. C. Millar, treas.; L. E. Woolley, gen. supt. of ref.; R. L. Rude, supt., W. C. Gault, asst. supt., Toronto, Ontario; D. W. Monroe, supt., Montreal East, Quebec; J. E. Joyce, p. a. Refineries located at Toronto and Montreal, Canada.

Canadian Oil Companies, Ltd., 12 Strachan Ave., Toronto, Ontario, Canada. F. B. Fretter, pres.; F. H. Littlefield, v. p. and g. m.; H. F. Hoecker, sec.; F. C. West, treas.; C. A. Hale, supt., Petrolia, Ontario; F. C. West, s. m. (tank car and bulk stations); E. Smith, c. e.; G. S. Middaugh, p. a. Refinery located at Petrolia, Ontario.



New refinery of the British American Oil Co., Ltd., Montreal, Ontario. Main features of plant designed and built by Winkler-Koch Engineering Co. Pressure distillate stabilizer and recovery unit built by Black, Sivalls and Bryson.

* * * *

Home Oil Distributors, Ltd., 555 Burrard St., Vancouver, British Columbia. Blake M. Wilson, pres.; Austin C. Taylor, v. p.; W. W. Boultbee, sec. and treas.; Duncan Fraser, supt.; Leslie J. Martin s. m. (tank car); Frank E. Macarthur, s. m. (stations); A. F. Rees, c. e.; S. F. Barbour, p. a.

Imperial Oil, Ltd., 56 Church St., Toronto, Ontario, Canada. C. O. Stillman, pres.; G. H. Smith, A. M. McQueen, Victor Ross, v. p.; F. E. Holbrook, sec. treas.; L. C. McCloskey, director of mfg.; Charles Leaver, gen. supt. of ref.; A. D. Grant, supt., E. E. Dauphince, asst. supt., Ioco, British Columbia; C. M. Moore, supt., J. J. Hanna, asst. supt., Calgary, Alberta; George Leach, supt., C. R. Moore, asst. supt., Regina, Saskatchewan; G. L. Stewart, supt., Sarnia, Ontario; F. C. Mechin, supt., J. J. McCarthy, asst. supt., Montreal, Quebec; R. L. Dunsmore, supt., R. D. King, asst. supt., Dartmouth, N. S.; J. McNeil, director of sales; T. Montgomery, c. e.; Gordon McIntyre, c. e.; Dr. R. K. Stratford, chief research chem.; L. E. Bury, p. a. Refineries located at Ioco, British Columbia; Calgary, Alberta; Regina, Saskatchewan; Sarnia, Ontario; Montreal, Quebec; Dartmouth, N. S.

Maple Leaf Petroleum, Ltd., 617 C. A. Johnson Bldg., Denver, Colo. P. R. Naylor, pres.; Milton Smith, Jr., v. p.; John P. Akolt, sec. and treas.; L. S. Sweeney, supt.; T. L. Pittman, asst. supt.; C. C. Peake, s. m. (tank car and bulk stations); T. L. Pittman, c. e.; K. R. Jallings, c. e.; A. T. Bower, p. a. Refinery located at Coutts, Alberta, Canada.

The McColl-Frontenac Oil Co., Ltd., Royal Bank Bldg., Montreal, Ontario. John Irwin, pres.; J. M. Pritchard, v. p. in charge of sales; Fred Hunt, sec. and treas.; C. B. W. Anderson, supt.

North Star Oil, Ltd., 308 Scott Block, Winnipeg, Canada. T. N. Clayton, v. p. and g. m.; S. T. McGinn, sec. Refinery located at Winnipeg, Canada.

Northwest Stellarene Co., Inc., Shelby, Mont. James W. Johnson, B. E. Hepler, v. p.; F. E. Cannon, sec. and treas. Bud Vadnais, supt., Shelby, Mont.; James W. Johnson, s. m. (tank car and bulk stations); F. W. Eley, c. e.; G. B. Taylor, p. a. Refineries located at Shelby, Mont., and Coutts, Alberta.

Regal Oil & Refining Co., Ltd., Calgary, Alberta. Frank P. Book, pres. A. E. O'Brien, E. L. Harvie, v. p.; E. L. Harvie, sec.; A. E. O'Brien, treas. and g. m.; B. J. Manley, supt., J. Shanahan, asst. supt., Calgary, Alberta; H. E. McDonald, s. m. (tank car and bulk stations); W. Daly, c. e.; G. E. S. Georgecu, c. e.; F. R. Carey, p. a. Refinery located at Calgary, Alberta.

Seaboard Oil & Refining Co., 110 Water St., Vancouver, B. C. D. P. Boyd, pres.; C. W. Durbrow, Edwin R. Sheldon, v. p.; E. Robertson, treas. and sec. Frank Milliff, supt.; D. B. Boyd, s. m. Refinery at Vancouver under construction.

Simrall Refining Corp., 511 Union Central Bldg., Cincinnati, Ohio. W. F. Simrall, pres.; R. P. Crothers, sec.; A. J. Buschle, treas.; R. P. Crothers, gen. supt. of ref.; E. H. Crawley, supt., Horse Cave, Ky.; C. G. Miller, supt., Amherstburg, Louisville, Ky.; George Stoll, s. m. (tank car). Refineries located at Horse Cave, Ky., and Amherstburg, Ontario.

Sterling Oil Refineries, Ltd., Moose Jaw, Saskatchewan, Canada. L. D. Ohrn, pres. and g. m.; Hal Berry, S. A. Hamilton, v. p.; James Kennedy, sec. and treas.; Don J. Baize, gen. supt. of ref. Don J. Baize, supt., William Penno, asst. supt., Moose Jaw, Saskatchewan; D. C. Archbald, s. m. (tank car); W. W. Baize, c. e.; W. J. McNabb, p. a. Refinery located at Moose Jaw, Saskatchewan.

SURVEY OF OPERATING REFINERIES IN CANADA

Company and plant location—	Crude oil cap.	Crack. cap.	Type of plant	Type of cracking plant
ALBERTA				
Imperial Oil, Ltd., Calgary	5,000	3,800	Comp.	Tube & Tank
Bell Ref. Co., Ltd., Calgary	750	500	S-C	Vapor Phase
Maple Leaf Pet., Ltd., Coutts	5,000	.....	S	
Northwest Stellarene Co., Inc., Coutts	1,500	1,000	S-C	Dubbs
Regal Oil & Ref. Co., Calgary	3,000	.....	S	
Total	15,250	5,308		
BRITISH COLUMBIA				
Imperial Oil, Ltd., Ioco	16,000	3,600	Comp.	Tube & Tank
Home Oil Distributors, Ltd., North Vancouver	1,000	.....	S	
Seaboard Oil & Ref. Co., Vancouver	*3,000	.....	S	
Total	17,000	3,600		
MANITOBA				
North Star Oil, Ltd., Winnipeg	500	.....	S	
Radio Refs., Winnipeg	1,000	.....	S	
Total	1,500			
NOVA SCOTIA				
Imperial Oil, Ltd., Dartmouth	17,000	6,000	Comp.	Tube & Tank and Burton
ONTARIO				
British American Oil Co., Ltd., Toronto	5,000	3,000	S-C	Own
British American Oil Co., Ltd., Montreal	8,000	5,000	S-C	Own
Canadian Oil Cos., Ltd., Petrolia	1,500	.....	S-L	
Imperial Oil, Ltd., Sarnia	22,000	14,600	Comp.	Tube & Tank
McColl-Frontenac Oil Co., Ltd., Toronto	10,000	4,000	S-C	Jenkins, Gyro
Simrall Ref. Corp., Amherstburg	2,500	.....	S	
Total	49,000	26,000		
QUEBEC				
Imperial Oil, Ltd., Montreal	30,000	8,000	Comp.	Tube & Tank
McColl-Frontenac Oil Co., Ltd., Montreal	8,000	4,000	S-C	Jenkins, Gyro
Total	38,000	12,000		
SASKATCHEWAN				
Imperial Oil, Ltd., Regina	7,200	4,500	Comp.	Tube & Tank, Burton
Sterling Oil Refs., Ltd., Moose Jaw	2,000	1,200	S-C	Sterling
Total	9,200	5,700		

*Under construction.

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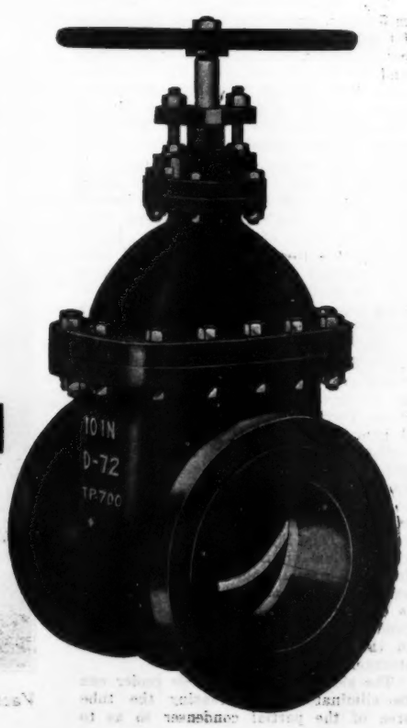

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Use Vacuum Pipe Still To Redistill 7,000 Barrels Daily Of Heavy Naphthas

* * * * * *

By H. D. Noll
Magnolia Petroleum Co., Beaumont, Tex.

The most economical method for carrying on low temperature fractionation of heavy naphthas is by distillation under a vacuum. The steam required is approximately 20 to 25 per cent of that necessary for atmospheric steam distillation.

The Magnolia Petroleum Co. recently installed a vacuum still for the purpose of redistilling 7,000 bbls. per day of heavy naphthas, having an initial boiling point of 275° to 325° F. The maximum temperature of the oil in the column was specified at 275° F.; the low temperature was required to improve the color stability of the gasoline produced. It has been determined that the decomposition of acid compounds formed in treating cracked naphthas increases rapidly above 275° F.

The vacuum tower is 16 feet in diameter, has six fractionating and two stripping trays and is equipped with internal heaters and reboilers. The heaters and reboilers consist of tubes within a trough. Steam is used through the tubes and the heavy naphtha gravitates from the upper trays outside the tubes overflowing a weir at the end of the trough.

Bottoms from atmospheric steam stills, treated, when necessary, with acid and caustic neutralized, constitute the feed for the vacuum still. The feed exchanges heat with the vacuum still residue in a tubular exchanger, and passes through a steam preheater before entering the tower on the second fractionating tray. The temperature of the feed is approximately 160° F. before entering the tower. No vaporization of the feed takes place at this temperature.

The absolute pressure on the dry line is 53 m.m. and at the base of the column 60 m.m. The small pressure drop indicates excellent design of the bubble trays and the partial condenser. The low pressure drop through the entire equipment makes possible a dry distillation without excessive losses, resulting from low pressures on the partial condenser.

The oil, after entering the tower, is heated to 265° F. by means of steam flowing through internal tubular heaters located in troughs on the second tray. Final heating of the bottoms, before leaving the tower, is accomplished with two internal reboilers located in troughs on the bottom tray of the tower. The temperature at the base of the column is 275° F.

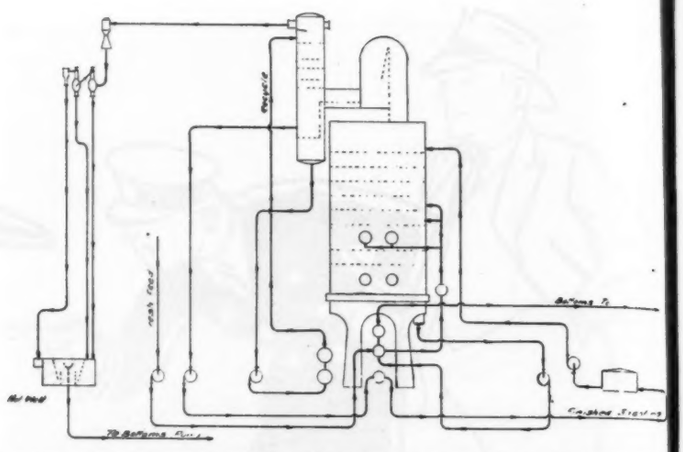
The vapors leaving the tower top at 215° F. enter a partial condenser. The tubes are arranged in the condenser so as to have a constant velocity through them. Pressure differentials of only 1 to 2 m.m. are obtained between inlet and outlet of the condenser. The liquid and gas are separated in a side column which has a vertical baffle. The liquid drops to the base of the tower, is cooled to 90°, and pumped into the top of the column. This liquid acts as an absorption medium on the uncondensed vapors from the partial condenser, with the result that a loss of only 0.5 to 1 per cent is obtained in the distillation. The final product is withdrawn from a solid deck in the side column, and is pumped to storage.

The side tower and recycle cooler can be eliminated by increasing the tube area of the partial condenser so as to obtain temperatures equivalent to that of the finished gasoline leaving the side tower. At the time of installation transfer rates in partial condensers operating under a vacuum were indefinite. At present a "K" value of approximately 125 is obtained in the partial condenser. The recycle is not withdrawn from the tower, but is permitted to rise until the naphtha flows over the baffle onto the solid deck. The tower is refluxed with finished product in the ratio of .35 reflux to 1 of product.

Vacuum as low as 15 m.m. can be obtained from the two-stage C. H. Wheeler equipment. At present the use of booster ejector is not required to obtain 50 m.m. on the dry line.

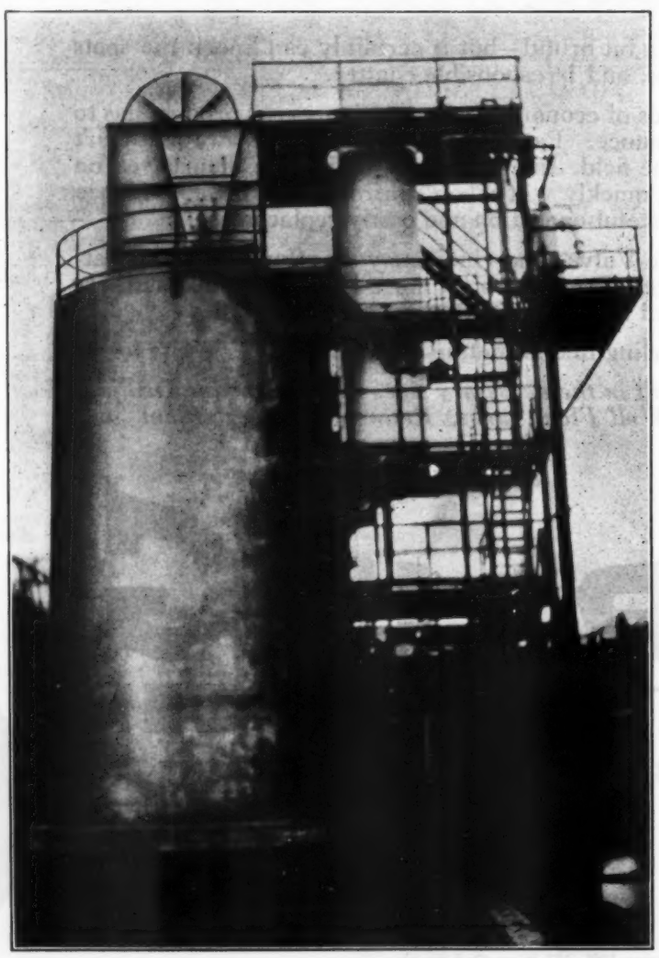
Characteristics of feed, overhead, and bottoms are given in Table 1. The most economical operating conditions are given in Table 2.

Test runs have been made of vacuum distillation of the pressure distillate bottoms from the debutanizers. The feed stock has an initial of 150 to 160° F., with a maximum of one-half per cent by volume of butane. The object of the test runs was to determine the economical value of processing this stock directly in a vacuum still. The flow of the feed and products is essentially the same as when operating on steam still bottoms. The operating conditions have to be altered so as to reduce the noncondensables to a minimum, and also obtain satisfactory stripping of the bottoms. The analyses of the feed, overhead, and bottoms are set forth in Table 3, and the operating conditions in Table 4.



Flow chart of vacuum still for distilling heavy naphthas at Beaumont, Tex., refinery of the Magnolia Petroleum Co.

* * * * * * * *



Vacuum still for distilling 7,000 bbls. of heavy naphtha at Beaumont, Tex., refinery of Magnolia Petroleum Co.

Table 1—Characteristics of Charging Stock and Products (Two-Stage Operation)

	Feed	Overhead	Bottoms
Gravity	43.4	44.3	36.1
Flash	110	...	170
Color	2NPA	28	6NPA
I.B.P.	316°F.	308°F.	398°F.
10%	333	326	404
20	340	333	409
30	347	340	414
40	356	346	420
50	363	352	427
60	369	358	434
70	379	363	441
80	387	371	460
90	402	382	498
E.P.	464	404	608
Rec.	98%	98%	98%

Table 2—Operating Data When Processing as Under Table 1

Temperatures—	°F.
Feed from storage	102
Feed from exchanger	140
Feed from preheater	165
Bottom of tower	275
Reboiler	273
Heater	261
Tray No. 5	244
Tower top	208
Steam	380
Partial condenser outlet	115
Vapor from partial condenser	102
Dry line	100
Naphtha recycle	104
Naphtha recycle from cooler	102
Reflux to cooler	108
Reflux from cooler	90
Gasoline to cooler	102
Gasoline from cooler	90
Bottoms from tower	274
Bottoms from exchanger	151
Bottoms from cooler	117
Water from gasoline cooler	89
Water from reflux cooler	94
Water from recycle cooler	103
Water from bottom cooler	89
Water from partial condenser	122
Fresh water	88
Water from first Barometric	88
Water from second Barometric	129
Condensate from heater	297
Condensate from reboiler	288
Absolute pressures—	
Dry line	53 m.m.
Reboiler	61 m.m.
Heater	59 m.m.
Partial condenser—inlet	55 m.m.
Partial condenser—outlet	53 m.m.

Table 3—Characteristics of Debutanized Pressure Distillate Charged and Products from Single-Stage (Vacuum Only)

	Feed	Overhead	Bottoms
Gravity	49.1	52.4	37.0
Flash	...	...	148
Color	10	30	3NPA
I.B.P.	158	155	280
10%	220	214	390
20	246	232	395
30	266	254	400
40	285	269	404
50	305	284	411
60	326	296	417
70	348	314	424
80	368	339	433
90	390	364	451
E.P.	455	392	596
Rec.	98%	98%	98%

A comparison of the utilities required

(Continued on Page 123)

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New Developments in Laboratory Control of Refining and Natural Gasoline Manufacturing

* * * * * *

By Walter J. Podbielniak

Research Chemical Engineer, Tulsa, Okla.

In this article are presented and briefly described several new developments by the writer in the field of special apparatus for precise laboratory control of refining and natural gasoline manufacturing. A detailed discussion of the individual apparatus mentioned will be given in articles to be published later.

1. The Podbielniak low-temperature fractionating apparatus is standardized in the form of a new single-unit model readily adaptable for any analytical or special work within its working range including the analysis of very small gas samples, routine gas and natural gasoline analysis, and the analysis of motor fuels and absorption oils. The fractionating columns of the apparatus have been radically simplified and improved.

2. The operation of the low-temperature apparatus has been made automatic by the development of a mechanical "robot" device which supplies refrigerant to fractionating column reflux, controls distillation rate according to difficulty of fractionation, summons the operator with buzzer and trouble light whenever the operator's assistance is required, and turns out a complete printed fractional distillation curve including a curve for the actual distillation rate throughout the analysis. The "robot" turns out distillations in less time and more accurately than is possible by manual operation.

3. The new Podbielniak High-Temperature Fractionating Apparatus, described for the first time in this article, may be used for the analysis of petroleum and its products into either individual hydrocarbons or close-cut fractions by precise fractionation up to 500°F or higher reflux temperature and down to a few mm. of mercury absolute distillation pressure. The resulting data are of importance to the refiner as furnishing the basis for efficient design and control of his equipment.

4. The design of sample containers for sampling and storing gases and volatile gasolines has been carefully standardized in accordance with I. C. C. regulations 4B-300 and 4C-116. The standardized containers have a trapless nipple and valve at each end protected by valve covers. Special packless valves are recommended for pressure gas and for liquid samples.

* * * * * * * * * * * *

Standardized Model of the Podbielniak Low-Temperature Fractionating Apparatus

The Podbielniak Low-Temperature Fractionating Apparatus for the analysis of gases and gasolines as developed and improved by the writer has been widely adopted throughout the petroleum industry, both in the United States and in all foreign oil fields, for the analysis of natural gas and gasoline, refinery and manufactured gases, absorption oils and motor fuels, petroleum crudes, etc., for their content of lower-boiling hydrocarbons determined individually, such as methane, ethane, ethylene, pentanes, etc., up to and including octanes. Such analysis includes the accurate determination of gasoline content of natural or refinery gas, the determination of amounts of propane and butanes recoverable from natural gas as liquefied petroleum gas, and determination of the undesirable ethane and propane in natural gasoline or in motor fuels.

Due to the growing importance of this apparatus and method of analysis, sometimes termed "fundamental analysis," to the petroleum industry, it has been highly desirable to (a) advance the development of the apparatus to a presumably final stage and (b) standardize on one apparatus model adaptable to analytical or special work that may be encountered within its working range. The development of such a finished and standardized apparatus model should prove of great convenience and practical value to users of this analytical method.

Accordingly, after exhaustive experiments, the Standard Precision Model A (United States and foreign patent applications pending) of the Podbielniak apparatus has been developed as shown in the photograph, Figure 1. The most significant feature of this model from the standpoint of standardization combined with utmost flexibility is the mounting of two fractionating columns on a single-unit framework, and the development of the two-part column construction, the latter shown in detail in Figure 2.

The apparatus may be readily adapted for the most accurate analysis of a particular kind of sample for either routine or exacting research purposes by (a) changing from the one column to the other; (b) selecting a suitable distilling tube from a wide variety of standard and special distilling tubes interchangeable within the standard column vacuum jackets (see classification of distilling tubes in Table 1); (c) using either the 1 or 3-gallon vapor receiving bottle provided with the apparatus or an external vapor-receiving system, or even a wet test meter if desired; (d) in the case of highly complex samples, using the new fraction collecting arrangement with optional size large capacity burets (ranging from 100 c.c. to 2,000 c.c.) as explained in a previous article[1]. Gas samples ranging from 500 c.c. to 50,000 c.c. (gaseous state) and liquid samples from 5 c.c. to 1,000 c.c. (liquid state) or more can be handled with maximum efficiency and accuracy.

The two-part column construction as illustrated diagramatically in Figure 2 deserves special mention. The sleeve-type metal reflector vacuum jacket is entirely separate, of fixed standard dimensions (made of mold-blown glass parts), and readily interchangeable with any of the wide variety of regular and special distilling tube-and-bulb assemblies as shown in Figure 2 and Table 1. For instance, the same vacuum jacket may be used either with a 5 c.c. capacity substandard bore distilling tube for the distillation of extremely small gas samples or with a 1,000 c.c. special flask and distilling tube for the determination of volatile hydrocarbon content of absorption oils. In case of breakage the distilling tubes are easily repaired or replaced at comparatively low cost. The vacuum jacket itself is of very simple and rugged construction.

A novel feature of the sleeve-type vacuum jacket is a highly polished metal reflector, suitably perforated to provide visibility, replacing the usual silver plating to which it is from 100 to 150 per cent superior in thermal insulation. This improved thermal insulation materially aids in obtaining sharp fractionation.

Another and very important feature is the Standard Precision cooling vessel also shown in Figure 2. With this improved type of cooling vessel, troublesome gasoline or other liquid reflux baths are eliminated. Complete control over the distillation is secured by the use of either the direct (Tubes A) or indirect (Tubes B) method of cooling or both and utmost economy obtained in the consumption of liquid air or other refrigerant. The cooling vessel is cemented and taped to the glass of the column parts so that the entrance and freezing of atmospheric moisture within the reflux chamber is practically eliminated. The

[1] "Analyzing Refinery Gases and Vapors," by Walter J. Podbielniak, The Oil and Gas Journal, Vol. 29, No. 26, p. 235, Oct. 2, 1930.

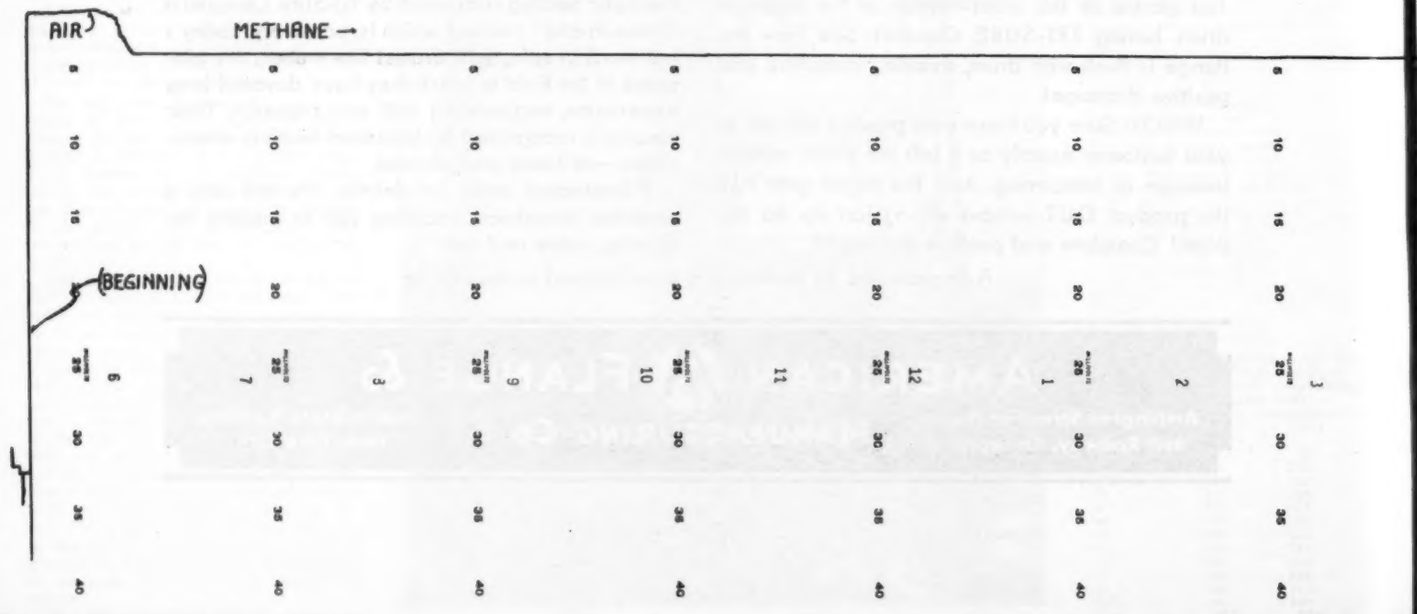


Figure 4. Fractional Distillation Curve Produced by Autom

conduit tubes from the surmounting cap to the body of the cooling vessel are made of special thin-wall metal alloy which conducts heat very poorly, thereby conserving refrigerant.

The apparatus is designed for highest possible accuracy possible with this method of analysis, for all combinations of distilling tubes, vapor receiving bottles, etc., as above. This accuracy ranges from a few hundredths per cent to a few tenths per cent depending of course on the ease of separation of given components, on the size of sample, amount of component, etc. To secure this possible accuracy, the vapor-receiving system is mounted in a large water bath, and the whole apparatus designed and calibrated appropriately for the highest practical accuracy.

While the Standard Precision model represents what is believed to be a satisfactory standardization of the apparatus proper, there remains the problem of standardization of analytical procedure. Although the same general principles apply to all "fundamental" analysis, yet there must naturally be variations in procedure to accommodate the great range of applications from the analysis of gas samples (themselves ranging in volume from 500 c.c. to 50,000 c.c. depending on the nature of the analytical work and amount of sample obtainable), to analysis of tar-like petroleum crude.

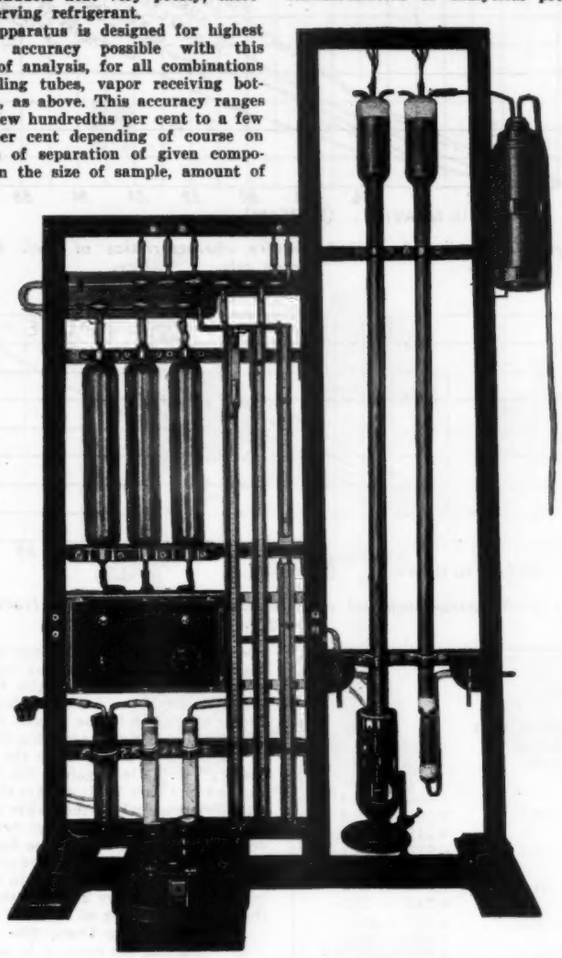


Figure 1. Standard Precision Model Podbielniak Low-Temperature Fractionating Apparatus.

TABLE 1—STANDARDIZED DISTILLING TUBES

Description		
Distilling bulb capacity	Bore of distilling tube	Recommended for:
5 cc.	3.2 mm.	Analysis of very small gas samples from a few hundred cc. to about 1,000 cc. or more, depending on amount of hydrocarbons condensible at liquid air temperature.
15 cc.	3.8 mm.	Analysis of natural gas, refinery gas, manufactured gas and other gas samples obtainable in quantities of 1 to 5 gallons per distillation.
35 cc.	3.8 mm.	Analysis of small liquid samples or of very large gas samples. May also be used for analysis of liquefied petroleum gas or of gas samples almost completely condensible at liquid air temperatures.
60 cc.	3.8 mm.	Analysis of liquid samples, including natural gasoline and motor fuels. Not suitable for gas analysis.
1,000 cc.	3.8 mm or 4.0 mm.	Analysis of large motor fuel and absorption oil samples containing small percentages of volatile hydrocarbons (below octane in molecular weight).

The distilling tubes listed above are illustrated in Figure 2. Any of these may be provided with an interchangeable ground glass joint between distilling tube and distilling bulb proper similar to the 1,000 cc. distilling tube-and-bulb assembly, however, unless required for special purposes, this is inadvisable due to tendency of any joint to leak at very low temperatures.

With a standardized apparatus and carefully prepared instructions for all possible applications, there remains another factor of co-ordinate importance—the operator himself. The operator must gain an understanding of the general principles of the analytical technic required and then acquire sufficient experience. As in the case of any other analysis or test, he should be given "unknowns" or checked on his accuracy in one way or another, until confidence is gained in his results. Similarly, periodic checking of results at all times is recommended.

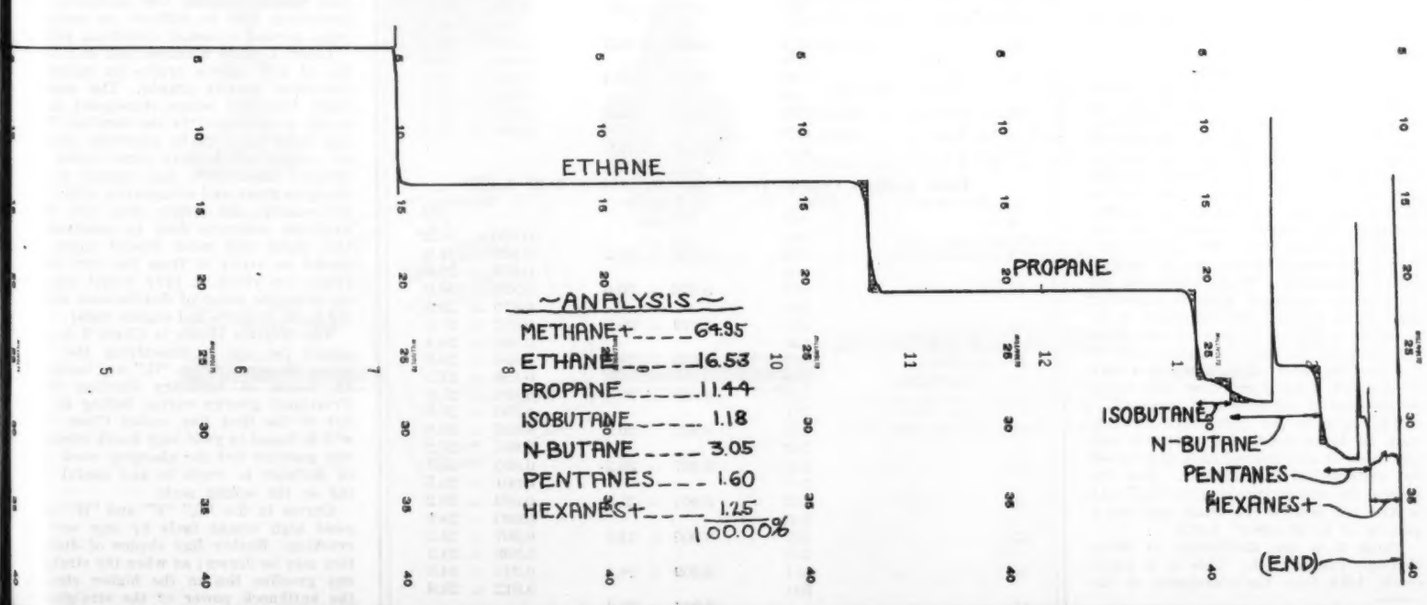
—o-O-o—

Automatic Recorder and Control for Podbielniak Low-Temperature Fractionating Apparatus

It is, of course, always desirable to either remove the human element completely from any test or to greatly reduce the extent to which it may affect the results. This may be done by automatic devices, as in the case of automatic gas volume measuring and recording meters, CO_2 indicating and recording meters, etc. The writer has developed a "robot" like mechanism (United States and foreign patent application pending) for the automatic control and recording of distillation with the low-temperature fractionating apparatus. It is shown in the photograph, Figure 3, operating a Standard Precision model apparatus. However it may be used with any previous model possessing either a Precision or Standard Precision column.

This automatic apparatus supplies liquid air for reflux cooling as needed, controls distillation rate far more satisfactorily than is possible by manual operation, keeps distillation pressure constant, and plots the finished distillation curve directly on the chart of a specially adapted recording potentiometer instrument. In addition instantaneous distillation time rate is plotted continuously on the same chart. The operator's function is limited to preparing and checking the fractionating apparatus in the usual manner, making two simple adjustments on the "robot" according to overall time of distillation desired, and adjusting the heat supply to the column occasionally. Thereafter, his services are not required except when definitely summoned by the "robot" by a buzzer and by a trouble light denoting "Re-evacuation Needed," "More Liquid Air," or "Change Pres-

(Continued on Page 119)



Automatic Recorder and Control for Podbielniak Low-Temperature Fractionation. (Curve itself is actual photograph of recorder chart.)

Laboratory Method for Evaluating Crude Oils To Determine Octane Rating of Gasoline

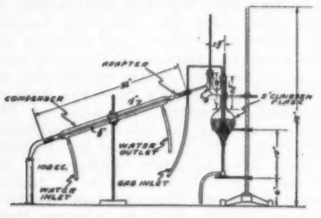
* * * * * *

By G. H. Clay
Kansas City Testing Laboratory

Gradual developments of the past few years have culminated recently in a situation where old methods of rating crude values have ceased to be applicable. The per cent of straightrun gasoline obtainable is no longer a criterion. The octane rating of the whole yield of motor fuel from a given crude is now the determining factor.

Leaving out of consideration those crudes whose values are based largely on the lubricating base or some other special property, the writer proposes a method for classifying crudes by which a laboratory distillation of the crude will suffice. The method is not original, having been used[1] for many years in comparing hydrogen mixtures. The application to present needs is based upon experience in analyzing petroleum stock from all over the world, and in classifying both finished fuels and charging stocks for use in high compression motors.

Briefly, the method is the fractional gravity distillation of 800 cc. of the crude in a 1,000 cc. Claisen flask with temperature readings every 2½ per cent and specific gravity readings of every 5 per cent fraction. The apparatus is shown in Figure 1. The specific gravity of the first 5 per cent represents the stream gravity of the 2½ per cent temperature reading. Likewise, the specific gravity readings of the 5 to 10 per cent fraction represents the stream gravity of the 7½ per cent temperature reading and so on, through to 572° F. vapor temperature. Interpolations in the stream



Fractional gravity distillation apparatus.

column will give the specific gravity for the 5, 10 and 15 per cent temperature readings, etc.

Specimen Tables

Specimen tables are furnished herewith: Table 1 shows the distillation and calculation of stream gravities of Wortham, Texas, crude. For the purpose of this discussion the distillation ends at the 580° F. point. For further valuable information, it may be continued by the use of coal gas, natural gas or carbon dioxide. The fractional gravity of subsequent fractions is recorded without further vapor temperatures. An oil temperature thermometer is installed and the distillation continued without exceeding 650° F. in the oil. The condenser is allowed to warm up to prevent wax from collecting in the tube. In this way, 70 per cent or more of asphaltic oils may be distilled without cracking, and up to 90 per cent of ordinary light crude oil.

The data in the first three columns may be interpolated and gravities and per cents of any desired cuts determined by arithmetical calculations. For instance, the straightrun gasoline (437 cut) is 41.4 per cent of the crude and has a gravity of 0.746=58.2° A.P.I.

Table 2 is the distillation of Starr County, Texas, crude. This is a heavy crude, both from the standpoint of the specific gravity of its fractions and from the standpoint of containing very little gasoline. This crude and the Wortham crude shown above are of strikingly different character in the octane rating of the gasoline derived, and this difference is revealed graphically when the "stream gravity" is plotted against the temperature as in Chart 1. It is this characteristic difference which the writer proposes to utilize in the grading of crudes for octane number, for it has been found that the farther the fractional gravity curve moves to the right, especially in the temperature range above 250° F., the higher the antiknock rating of the fuel.

[1]Various editions of the Handbook of Petroleum, Asphalt and Natural Gas of the Kansas City Testing Laboratory.

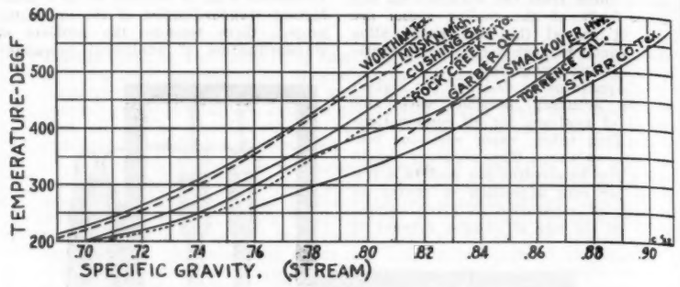


Chart 1—Showing fractional gravity characteristics of well known crude oils.

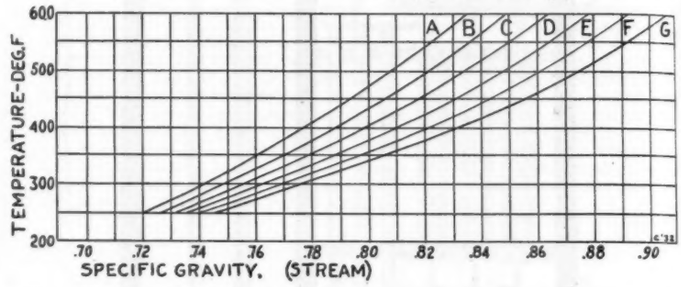


Chart 2—Showing proposed classification of crude oils by fractional gravity.

CRUDE ANALYSIS

Table 1—Wortham, Texas, Currie Well. Gravity .800 = 45.5° A.P.I.

Per cent—	Temp. ° F.	Fraction	Stream
0	103		
	203		0.685 = 75.1°
5	237	0.685 = 75.1°	0.701 = 70.4
	260		0.718 = 65.6
10	280	0.718 = 65.6	0.727 = 63.1
	297		0.735 = 61.0
15	311	0.735 = 61.0	0.740 = 59.7
	324		0.746 = 58.2
20	337	0.746 = 58.2	0.751 = 56.9
	351		0.756 = 55.7
25	365	0.756 = 55.7	0.759 = 54.9
	375		0.763 = 54.0
30	385	0.763 = 54.0	0.768 = 52.8
	396		0.772 = 51.8
35	407	0.772 = 51.8	0.775 = 51.1
	419		0.778 = 50.4
40	432	0.778 = 50.4	0.781 = 49.7
	441		0.784 = 49.0
45	450	0.784 = 49.0	0.788 = 48.1
	461		0.792 = 47.2
50	473	0.792 = 47.2	0.794 = 46.7
	483		0.796 = 46.3
55	493	0.796 = 46.3	0.799 = 45.6
	503		0.803 = 44.7
60	514	0.803 = 44.7	0.806 = 44.1
	526		0.809 = 43.4
65	540	0.809 = 43.4	0.812 = 42.8
	553		0.815 = 42.1
70	566	0.815 = 42.1	0.817 = 41.7
	580		0.820 = 41.1
75	gas	0.820 = 41.1	

Table 2—Starr County, Texas. Gravity .924 = 21.6° A.P.I.

Per cent—	Temp. ° F.	Fraction	Stream
0	407		
	433		0.859 = 33.2°
5	450	0.859 = 33.2°	0.866 = 31.9
	463		0.873 = 30.6
10	473	0.873 = 30.6	0.876 = 30.0
	481		0.879 = 29.5
15	489	0.879 = 29.5	0.882 = 28.9
	496		0.885 = 28.4
20	502	0.885 = 28.4	0.887 = 28.0
	509		0.890 = 27.5
25	516	0.890 = 27.5	0.891 = 27.3
	521		0.893 = 26.9
30	526	0.893 = 26.9	0.895 = 26.6
	533		0.897 = 26.2
35	540	0.897 = 26.2	0.899 = 25.9
	547		0.901 = 25.5
40	553	0.901 = 25.5	0.903 = 25.2
	560		0.905 = 24.8
45	567	0.905 = 24.8	0.907 = 24.5
	575		0.909 = 24.1
50	584	0.909 = 24.1	0.910 = 24.0
	594		0.912 = 23.6
55	...	0.912 = 23.6	

Evaluating Crude Oils

In evaluating the crude it is not necessary to take into account the effects of numerous types and conditions of cracking. The effect of cracking must be considered but rather as a constant, and according to general moderate cracking procedure carried to the optimum limit. Some exception will be taken to the use of 437° F. cut in assaying the gasoline. This figure has more recognition than any other in use for motor fuel assay, and is a practical one from the general fuel standpoint. The low endpoints now prevailing will be difficult to maintain when normal economic conditions return.

Chart 1 shows a comparison of a number of well known crudes by means of fractional gravity graphs. The relative value from the octane standpoint is directly proportional to the location. This has been found to be generally true of all crudes which have come under the writer's observation, and applies to the charging stock and straightrun alike. Unfortunately, the writer does not have available adequate data to substantiate this claim and must depend upon the reader to verify it from his own experience (to check it fully would require an elaborate series of distillations, cracking tests, recycles and engine tests).

The diagram shown in Chart 2 is suggested for use in classifying the oils. Seven classes, "A" to "G," are indicated by means of arbitrary dividing lines. Fractional gravity curves falling to the left of the first line, called Class "A," will be found to yield high knock straightrun gasoline and the charging stock will be difficult to crack to any useful rating on the octane scale.

Curves in the "E," "F" and "G" class yield high octane fuels by any sort of cracking. Rather fine shades of distinction may be drawn; as when the straightrun gasoline lies in the higher classes, the antiknock power of the straightrun gasoline will be good regardless of the

(Continued on Page 123)

STANDARDIZE ON LUNKENHEIMER

Fig. 73
"Renewo" Globe

Fig. 554
Swing Check

Fig. 1720
Steel Globe

Fig. 1021
"Ferrenewo" Globe

Fig. 427
Double Disc Gate

Fig. 768
Wedge Disc Gate

Fig. 1640
"King Clip" Gate

Fig. 1430
Iron Body Gate

Fig. 1427
Iron Body Gate

Fig. 1728
Steel Needle Valve

Fig. 2001
"Slaset" Lubricated

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Valves for practically every requirement are included in the Lunkenheimer line. The wide selection permits standardization on these quality products for general use in the fields and throughout the manufacturing process.

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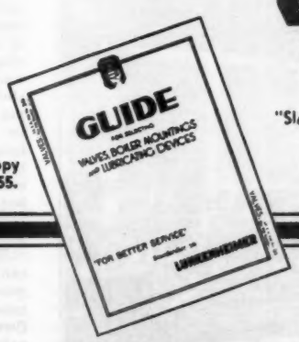

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Associated Oil Company Operates Largest Tube and Tank Cracking Unit

* * * * * *

By P. H. Wood, J. A. Thomas and R. B. Fawcett
Associated Oil Co.*

A 10,000-bbl. cracking unit of the tube-and-tank type, believed to be the largest completed plant of its type in the world was placed in operation by the Associated Oil Co. at Avon, Calif., June 15, 1931.

The cracking furnace is designed for a heat pick-up of 50,000,000 B.t.u. per hour, 85 per cent of which is transferred in the radiant heat section. A two-layer tube arrangement covers the upper side walls and all of the roof of a box-like furnace. Oil burners are arranged in a central group in the lower front wall. A large area of the raised floor is given over to a gas burner installation. In this arrangement the roof tubes are some 30 feet above the floor. At the rear a checker-work curtain wall is provided between the radiant section and a wide shallow breeching that contains the convection bank where the remaining 15 per cent of the total heat is picked up by three tube layers.

Structurally, the viscosity breaking furnace is identical with the cracking furnace. This similarity was required to carry out plans for maximum flexibility by having interconvertible furnaces. As a viscosity breaker is designed to have the major time element for cracking, while the oil is still in the tubes, however, the furnace has a very different arrangement of tube tanks. The radiant section of this furnace is very similar to that of the cracking furnace, although there is less installed tube surface. The oil enters a screen bank just back of the curtail wall, continues through the radiant section, and comes back to the convection section to enter a soaking or time element section of tubes. Since that portion of the convection section immediately behind the curtain wall is subject to a screened radiant as well as a strong convection heat pick-up, the incoming oil is first passed through the screen bank so that the necessarily high transfer rate at this point does not cause an excessively high film temperature condition. As in the cracking furnace, some 80 per cent of the total of 30,000,000 B.t.u. per hour is picked up in the radiant section.

Tubes in the cracking furnace are 4½ inches (outside diameter), with a wall thickness of 0.4 inch. The comparatively thin wall design is possible because of the high allowable creep stress permissible with the KA2S alloy of which they are fabricated. The viscosity breaker furnace contains the usual low carbon steel tubes, 5 inches outside diameter, with a wall thickness of five-eighths inch. Tubes of both furnaces can be cut back a few inches at the return bends and rerolled if excessive corrosion should take place at the ends.

Type of Pumps

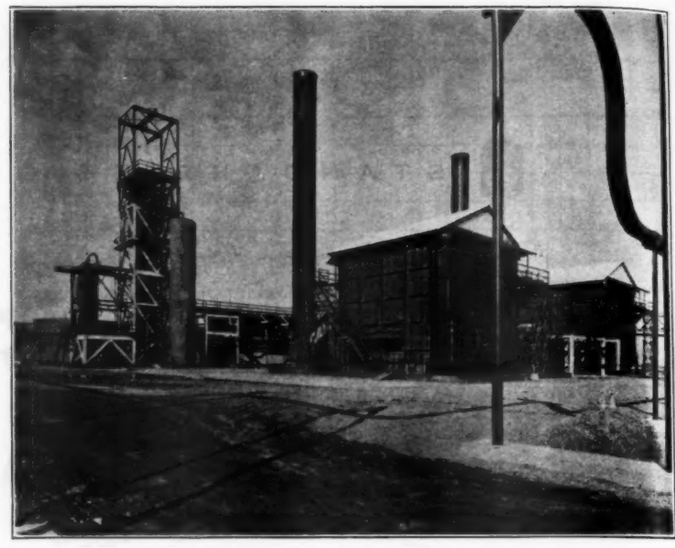
Of almost equal interest mechanically are the hot charging pumps. The cracking furnace pump was designed to handle 520 g.p.m. of 600° F. oil at a discharge pressure of 1,500 pounds per square inch, with a little more than 50 pounds on the suction. Due to the low specific gravity of the oil at this temperature the pump must develop close to a 5,000-foot oil head. For these conditions there was selected a 8-inch 9-stage horizontal centrifugal unit directly connected to a 750 horsepower, 3,450 r.p.m. steam turbine.

The pump itself differs from the usual design in that the individual stages have separately cast volutes of chrome alloy steel with cast alloy heads, all of which are assembled in a solid forged steel outer shell. The runners are arranged in a direct series, no attempt being made to balance alternate stages against each other. After the last runner there is provided a pressure reducing drum with its outer side relieved back to the suction to form a hydraulic balance for the whole assembly. Should any additional thrust occur, it is taken by a double-acting Kingsbury thrust bearing. With suction pressure only on the ends of the runner assembly, the stuffing boxes are thus required to be packed against only 50 pounds pressure. All integral parts in contact with the liquid are of chrome alloy steel, and the shaft sleeves, reducing drum and impeller skirts are stellited as a protection against excessive abrasive action. The shaft itself is of chrome vanadium steel. The stuffing boxes are water cooled through a lantern ring installed integrally with the packing, and water is also forced through the pump base.

A small auxiliary pump is mounted on the end of the main shaft to provide forced lubrication for the main bearings. For the starting up period, a small auxiliary steam reciprocating pump is provided.

The pump for charging the viscosity breaking furnace is a four-stage unit generally similar to the larger unit, and is directly coupled to a 250 horsepower, 3,450 r.p.m. steam turbine.

*P. H. Woods and J. A. Thomas, engineering department, and R. B. Fawcett, research department.



General view of tube and tank cracking unit showing the main heating furnace and the viscosity breaker in the foreground and the fractionating tower in the rear.

* * * * * * * * * * * *

With a total of 20,000 pounds per hour of steam required to drive the two main pumps and 8,000 pounds per hour being taken by miscellaneous other units, it was found desirable to supply steam of 250 pounds per square inch pressure with 100° of superheat and to exhaust all units to a centrally located condenser. Salt water being relatively plentiful and fresh water scarce, condenser cooling water is supplied from the main salt water pumping plant and very little condensate is lost, the hot-well pump discharging directly back to the boiler supply tank. The boiler plant supplies steam to the cracking unit only, as the steam system for the balance of the refinery operates at a lower pressure.

Pressure Vessels

The reaction chambers, or soaking drums, each weigh more than 120 tons and are of one-piece forged steel construction. The barrel is 42 feet long and 6 feet inside diameter, with a nominal shell thickness of 5½ inches and a minimum of 4¾ inches. At the points of support the shell thickness is increased to 8 inches and the conical ends, where the barrel is drawn down to the manholes, vary from 8 inches down to 4 inches in thickness. The interiors of the drums are lined with 1½ inches of gannister reinforced with steel rods and mesh clip-welded to the shells, the lining being applied with a gunnite machine. Special care was exercised around nozzle openings to minimize erosion effects. The exteriors of the drums are insulated with 3 inches of superex over which is applied 3 inches of 85 per cent magnesia and the whole is covered with a suitable cement and waterproof coating.

The evaporator and fractionator towers are each 10 feet in diameter, with a shell one-fourth inch thicker than required for strength in order to take care of corrosion arising from gases liberated in the process. Bubble plates in the fractionator are nonremovable, but manholes are provided between all plates to facilitate inspection and replacement of bubble caps, of which there are upward of 200 per plate. The towers are riveted and electrically caulk welded.

Piping Arrangement

The transfer line between the cracking furnace and the evaporator is KA2S tubing, and that between the viscosity furnace and the evaporator is steel tubing, both being equipped with special fittings designed to permit cleaning out of coke with a boiler tube cleaner. At the end of each joint of tubing, or at changes in direction, the fittings are so constructed as to give straight-away access to the bore of the tube.

Should an occasion, such as the rupture of a furnace tube, arise, requiring immediate relief from pressure, the contents of the system or any portion thereof may be dumped to a blowdown tower situated about 800 feet from the refining unit by means of air motor operated slide gate valves located at strategic points. It is necessary for the operator in the control room to throw only one lever to operate the motor valves and at the same time open a valve which allows a stream of water to pour down over the hot oil in the quenching tower.

Miscellaneous Features

The control of the entire plant has been centralized to a main panel board in the pumphouse, where all operating instruments are placed and where all rates of flow, pressure, temperature and the dump valves are controlled by means of suitable thermometers, pressure gauges and control switches or valves. The flow through the unit is governed by changing the speed of the turbines driving the charging pumps; pressures at certain points of the system are controlled by manually operated valves; and levels in the accumulators are maintained with

Hot oil charging pump. The centrifugal pump is driven by a 750 horsepower directly connected 3,450 r.p.m. steam turbine.

liquid level controls. These levels are relayed to the control room by an electric light system. Thermocouples are located at various points throughout the system and are all connected to the same indicating instruments on the control panel. At these same points there are also located indicating thermometers. In this manner all important readings can be obtained from either of the two instruments, which serve as a check against each other.

One feature that was kept constantly in mind in the design of the plant was that of safety for both operators and equipment. Examples of this are: A solid concrete wall on the side of the pumphouse facing the furnaces, soaking drums and high-pressure lines, to minimize danger from explosion; paving over the entire plant area to facilitate washing down of oil spills and thus to promote cleanliness and to provide safety underfoot; firewalls completely surrounding individual sections of the unit, such as each furnace, the towers and the pumphouse, in order that fires shall be localized if breaks occur.

System of Operation

The plant was primarily designed for what has been termed combination operation. This method consists essentially of two steps, the first being a viscosity breaking process wherein residuum is charged and is cracked mainly to fuel oil and gas oil, and the second being the final cracking of gas oil to pressure distillate. By this system of cracking, it is possible to operate the furnaces at optimum conditions for both the residuum and the gas oil, and thereby to gain an advantage over the ordinary methods of cracking in which the stocks of wide boiling range must be subjected to one set of conditions.

When the plant is operated on the normal, or combination system, fresh residuum charging stock is pumped at the rate of 10,000 bbls. per day through heat exchangers into an accumulator located above the evaporator, during which process of heat pick-up the temperature of the oil is raised from 150° F. to about 600° F. A hot oil pump, whose discharge rate is held constant, draws the oil from the accumulator and forces it through the viscosity breaker furnace at an inlet pressure of about 800 pounds per square inch.

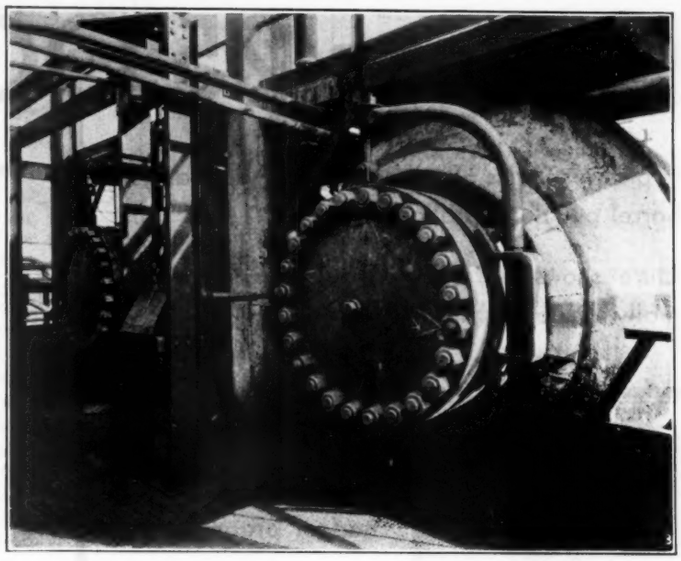
The purpose of the viscosity breaker furnace is primarily to separate gas oil from the residuum and to crack the remainder sufficiently to lower viscosity and pour test. A small amount of pressure distillate is also formed. The oil is heated to about 825° F. and is held at that temperature as it passes through the soaking section of the furnace. Under these conditions coke formation is avoided and a fuel oil of low sediment content is obtained. The viscosity breaker operates on a once-through basis, no recycle stock being added to the charge.

The oil from the viscosity breaker furnace is discharged through a hand-operated throttling valve directly into the evaporator from the bottom of which cracked fuel oil is drawn out through heat exchangers and cooler to storage. The gas oil and pressure distillate from the evaporator pass overhead in the form of vapors through heat exchangers to a fractionating tower. Here the vapors are subjected to thorough fractionation, the pressure distillate passing overhead through a partial condenser to a final condenser box.

The gas oil entering the fractionating tower is condensed by both partial and direct reflux and drops to an accumulator located in the base of the fractionating tower. A hot oil pump takes suction from this accumulator and discharges the oil at about 600° F. and 1,200 pounds per square inch to the cracking furnace.

The nominal rating on the cracking furnace is 4,000 bbls. per day, but with a recycle ratio of 2½ or 3 to 1, the actual fluid flow through the furnace is 10,000 or 12,000 bbls. per day. The furnace is designed only for heating the oil and allows for little time of reaction. The oil leaves the cracking furnace at close to 900° F. and flows in parallel streams through two reaction chambers, where the time element necessary for cracking is provided. Pressure is reduced at the outlet of the reaction chambers and the oil flashes into the evaporators. The discharges from both the viscosity breaker and cracking furnaces comingle in the evaporator and pass through the fractionating and heat exchanger equipment as described above. In this manner any unconverted gas oil drops out as fuel oil or combines with the oil in the gas oil accumulator as recycle stock.

Considerable fixed gas is produced by the cracking operation and passes out with the overhead from the fractionator. After the pressure distillate is condensed it passes to a separator where the gas is taken off. A back pressure valve holds a pressure of about 50 pounds per square inch on the fractionating equipment. The wet gas passes through an absorber where a small quantity of gasoline is recovered, and the dry gas is then returned to be used as fuel in the two furnaces. The pressure distillate is held under pressure until it is stabilized.



Method of suspending clean-out doors on the cracking chambers.

Extreme Flexibility

The need for a cracking plant of extreme flexibility to fit present rapidly changing conditions in the petroleum industry dictated the company's choice of this new equipment. The new plant, the result of much study, is adaptable to various methods of processing different types of charging stocks, the properties of whose products may be varied at will.

Results of First Operations

Considerable experimentation with the many possibilities of operation offered in the unit has been productive of very interesting results. A careful study of operating conditions was conducted during actual runs of the unit to determine results of operations under three methods. The first system used was the combination plan, the second the direct charging of residuum to the cracking furnace, and the third the charging of straightrun gas oil directly to the cracking furnace.

A 10-day run under the normal or combination plan as described above indicated the unit to be operating up to expected yields and characteristics of products. This is the standardized method adopted, except for test periods on other methods outlined below. On this combination operation, highly satisfactory yield and capacities have been obtained on runs lasting from 15 to 23 days.

Under the second plan of operation, residuum is charged through the heat exchangers to the gas oil accumulator where it is picked up and pumped through the gas oil cracking furnace at an outlet temperature of about 860° F. The stock discharges through the reaction chambers to the evaporator tower, heavy fuel being separated and the lighter products passing on to the fractionating tower. Here the gas oil is condensed and drops down to the accumulator where it mixes with fresh residuum. Thus when equilibrium is established, the stock charged to the cracking furnace has a wide boiling range, and consists roughly of one part residuum and one part gas oil.

It is evident that in order to adapt the cracking unit to this type of operation it is necessary merely to blank off the viscosity breaker system from the rest of the unit. In case this type of operation should become more feasible than the combination operation, the viscosity breaker may be converted to a cracking furnace by rearrangement of the tube layout in the furnace and by installing two more reaction chambers or by using one reaction chamber after each of the furnaces. The two furnaces would then be operated in parallel, discharging their products into the common fractionating equipment.

In a 15-day run by direct cracking, both reaction chambers were well coked, in contrast to conditions following runs on combination operation. Using the third plan and a plant hook-up exactly the same as that used in direct cracking, gas oil has been charged in place of residuum. Furnace outlet temperatures were maintained at 900° F. with a throughput ratio of about 3 to 1. In a short run, exceptionally high yields were realized in spite of the fact that the viscosity of the fuel oil was low.

In the absorption plant approximately 3 gallons of gasoline per 1,000 feet of wet gas are recovered. This absorbed gasoline is then combined with the pressure distillate stream from the cracking unit, and the combined stream is taken to the treating plant for further processing.

The E. B. Badger & Sons Co. completed the installation of the unit last year.

REFINING COMPANIES NAMED IN AWARDS AND DIPLOMAS

Oil company employes were awarded a major portion of the gold and silver medals and diplomas for acts of heroism in performance of duty at the recent annual distribution of awards by the Joseph A. Holmes Safety Association in Washington, D. C. The organization, named in honor of the first director of the U. S. Bureau of Mines, has a close affiliation with the bureau, and D. Harrington, secretary of the association, is chief engineer of the Safety Division of the Bureau of Mines. In his annual report to the association, Secretary Harrington declared that 1931 marked a period of excellent performance in promoting safety in mining industries notwithstanding the financial depression.

There were three silver medals awarded to coal workers. Two gold medals and three silver medals were awarded to oil company employes out of a total of eight awards for individual acts of heroism. Among 48 certificates of honor for achievements in keeping the accident rate low, awarded to industries, three went to oil companies.

The list of awards to individuals and companies in the petroleum industry follow:

Harry A. Tapley, assistant electric lineman, Shell Co. of California, was given a silver medal and diploma for his bravery in making an unsuccessful attempt to save the life of William G. Smith, lineman in charge, who was burned to death while working on an electrical transformer at Signal Hill, Calif., October 3, 1929. Mr. Tapley, at great personal risk, brought Mr. Smith down from a pole where the latter was hanging by his safety belt, his clothing afire. After falling 10 or 12 feet on his first attempt at climbing a telephone pole, Mr. Tapley climbed the pole a second time and, in spite of being severely burned in handling Mr. Smith, succeeded in lowering him to the ground without either coming in contact with a primary wire though Mr. Smith died later from burns.

Emery Ewing, an employe of the Union Oil Co., was awarded a gold medal and diploma for saving the life of Frank Bragg on the occasion of a fire at a bulk gasoline storage station, at Visalia, Calif., December 29, 1930. With the entire station aflame and his own clothing on fire, Mr. Ewing dragged Mr. Bragg from the fire zone.

I. H. Lantz, employe of the Simms Oil Co., Dallas, Tex., was given a gold medal and diploma as a token of his courage in rescuing Dudley W. Caswell, whose clothing was ablaze, due to his efforts to extinguish a gasoline fire on September 1, 1929. Lantz himself was severely burned and was confined to the hospital for more than two months.

George R. Mossholder, driller, and James M. Kilborn, tool dresser, Gulf Production Co., were given silver medals and diplomas in recognition of resourcefulness and courage displayed when the well which they were drilling in Crane County, Texas, began suddenly to spray oil and gas containing a high concentration of poisonous hydrogen sulphide on December 4, 1931. Kilborn was overcome by the deadly gas fumes. Mossholder, after shutting off the electric switch, returned to the derrick in an effort to rescue Kilborn but was himself overcome. Kilborn fell out of the gas area and upon regaining consciousness returned and rescued Mossholder. Neither man hesitated to take the risk required to save the other man's life.

The Shell Petroleum Corp., St. Louis, Mo., for operation of its properties, employing an average of 10,538 men, with remarkably low accident rates, the accident frequency rate being reduced from 51.4 in 1926 to 11.1 in 1931, and accident severity rate from 2.54 in 1926 to 0.47 in 1931.

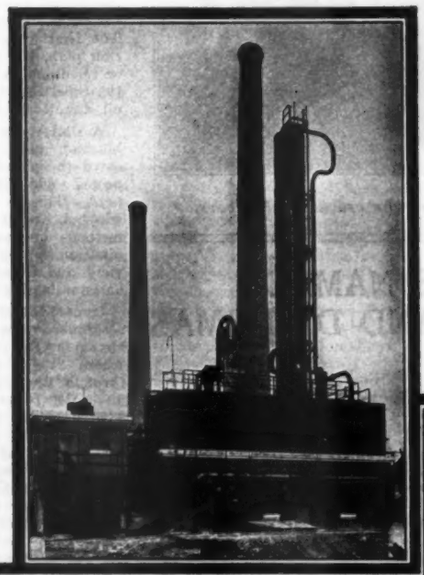
The Salt Creek (Wyoming) Field, Midwest Refining Co. for its excellent record in accident prevention in 1931. With 1,988,376 man-hours of exposure, there were but five lost-time accidents and no fatalities, the accident frequency of 2.51 in 1931 being even lower than the best previous record of 3.3 for this company in 1930.

The oil refinery of the Mexican Petroleum Corp. of Louisiana, Destrehan, La., for working since October 23, 1930, with an average force of 206 men, without a lost-time accident or fatality and with 575,390 man-hours of exposure.

2,500 or 25,000

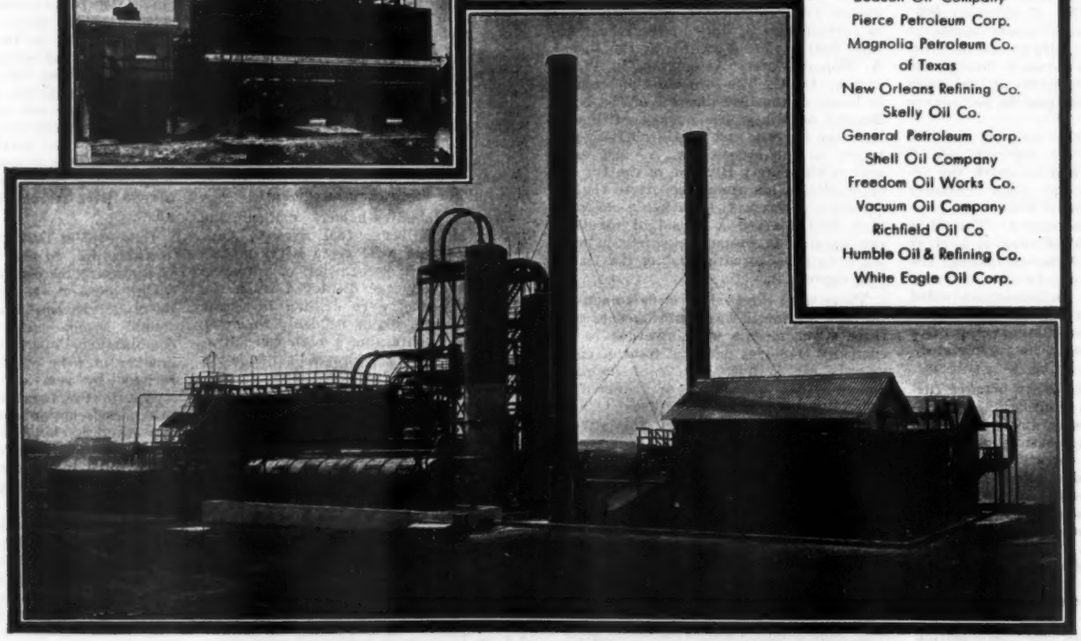
ONE of the pictures in this advertisement shows a Badger 2,500 barrel per day installation.

The other picture shows a 25,000 barrel per day installation, incidentally the largest in the world.



Both of these are atmospheric topping units designed and furnished by the Badger organization.

Badger Service offers material advantages regardless of plant capacity.



The following companies are some of those who have purchased BADGER Equipment:

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Texas Pacific Coal & Oil Co.
Associated Oil Co.
Penzoil Company
Independent Refining Co.
Gulf Refining Co.
Tidal Refining Co.
Continental Oil Co.
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Cities Service Refining Co.
Barnsdall Corporation
Beacon Oil Company
Pierce Petroleum Corp.
Magnolia Petroleum Co. of Texas
New Orleans Refining Co.
Skelly Oil Co.
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Lowest Gravity Crude From Kettleman Hills Cracked to Yield High Octane Gasoline

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By Gustav Egloff and E. F. Nelson
Universal Oil Products Co.

THE name of Kettleman goes back to 1849, when Dave Kettleman, having sailed around Cape Horn from New York, landed at San Francisco at the height of the gold rush. Instead of becoming a gold miner, however, Kettleman started a cattle ranch in San Joaquin Valley where Kettleman Hills are located. From a cattle ranch in '49, these Hills have become the site of probably the largest high gravity oil reservoir in the world.

Drilling has been going on, at intervals, in Kettleman Hills since 1900, according to government reports. All of these wells, however, were abandoned before reaching productive depths.

The discovery well of Kettleman Hills was completed in October, 1928, producing daily 4,200 barrels of 60 A.P.I. gravity light colored oil and 100,000,000 cubic feet of gas from a depth of 7,321 feet. Another well producing 60 A.P.I. gravity oil yields 1,000 barrels a day from 6,850 feet with 20,000,000 cubic feet of gas. In April, 1930, a deeper well at 7,691 feet produced 54 A.P.I. gravity oil, containing a lubricating fraction. In September of that year a well began producing from 8,323 feet and now yields 11,130 barrels of 36 A.P.I. gravity oil and 17,690,000 cubic feet of gas per day.

The skimming of the high gravity crude oil yields 86 to 90 per cent gasoline while the heavier contains 37 to 46 per cent. From 100,000,000 feet of "wet" natural gas obtained from the high gravity oil, approximately 90,000 gallons of gasoline can be recovered.

Kettleman Hills natural gas usually contains about 83 per cent of methane, about 15 per cent of other paraffins lighter than pentane, and 1 per cent of pentane and heavier hydrocarbons. A typical analysis is shown in the table.[1]

KETTLEMAN HILLS WET NATURAL GAS[2]

	Pct. by vol.	Gals. per M. cu. ft. gas
Methane	83 26	....
Ethane	8 34	....
Propane	4 70	....
Isobutane	1.06	0 35
N-butane	1.54	0.45
Pentanes-plus	1.10	0.47

After removal of the gasoline content the remaining "dry" gas has a B.t.u. content of 1,100 per cubic foot and shows the following composition:

KETTLEMAN HILLS "DRY" GAS[3]

	Per cent
Methane	85.61
Ethane	9.14
Propane	4.0
Isobutane	0 78
n-Butane	0.47

This gas represents about 92 per cent by volume of the original natural gas.

Tremendous capacity for gasoline absorption is necessary at Kettleman Hills where there are several gas absorption plants, all but one of which has a greater capacity than 100,000,000 cubic feet of gas daily.

The January report of the Bureau of Mines which is the latest available, showed that the natural gasoline production of the Kettleman Hills plants was 13,495,685 gallons or approximately 400,000 gallons daily. The production for a long period exceeded 500,000 gallons daily, the present lowered output being due to restriction of gas and crude oil production.

This natural gasoline production was obtained from 10,675,889,000 feet of gas coming from the Kettleman Hills wells. The gas treated and the natural gasoline production far exceeded any other fields in California. The total gas treated by the natural gasoline plants in January totaled 35,060,973,000 feet. The natural gasoline production totaled 51,204,541 gallons showing that the Kettleman Hills plants produced more than 25 per cent of the State's total.

Kettleman Hills crude oil, cracked in its entirety, yielded 74.3 per cent of gasoline of 75 octane number. This process improved the yield and antknock value of the gasoline over the results obtained by skimming Kettleman Hills crude, cracking the residue and blending the resulting cracked gasoline with the straightrun. Direct cracking of crude oil has the important advantage that it eliminates the skimming step.

Heavy Kettleman Crude

The Kettleman Hills crude oil subjected to the cracking process came from the Ochsner zone of the Temblor formation, at a depth of about 8,300 feet. It is not to be confused with the lighter Kettleman Hills crude, which is of about 60 A.P.I. gravity and contains 86 to 90 per cent of gasoline.

The gravity of the crude used in the cracking tests was 38.4 A.P.I. and contained about 36 to 46 per cent straightrun gasoline.

The crude oil analyzed as follows:

ANALYSIS OF HEAVY CRUDE

A.P.I. grav.	38.4
Sulphur, per cent	0.26
Cold test, °F.	Below zero
B.s. and w.	Trace
Init. b. p., °F.	125

[1]Data from Oil Bulletin, July, 1931, pp. 507-511.
[2]Ind. & Eng. Chem. 22 1269 (1930).
[3]Ind. & Eng. Chem. 22 1269 (1930).

A.S.T.M. 100 c.c. Distillation

Pct. distilled over	Temp. °F.
5	180
10	216
20	272
30	328
40	392
50	462
60	524
70	599
80	688
90	718
Per cent over	98.0
Per cent coke by weight	2.1

Atmospheric distillation of the above crude yielded 37.2, 40.9 and 46.6 per cent of gasoline of 375°, 400° and 425° F. endpoint respectively. These straightrun gasolines show octane numbers of 62, 60 and 56 respectively. They tested as follows:

STRAIGHTRUN GASOLINES

Endpoint, °F.—	375	400	425
A.P.I. grav.	58.0	55.7	54.4
Color Saybolt	30.0	....	....
Sulphur, per cent	0 02	0.02	0.03
Init. b. p., °F.	118	130	134

A.S.T.M. 100 c.c. Distillation

Pct. distilled over	Temp., °F.		
5	152	160	168
10	170	180	184
20	196	202	212
50	246	256	272
90	336	342	374
Per cent bottoms	1.5	1.5	1.5
Per cent loss	0.5	0.5	0.5
Octane number	62	60	56

Cracking Kettleman Hills Crude Direct

The above crude oil, of 38.4° A.P.I. gravity, was converted into high antiknock motor fuel, residue oil and gas by the flashing method of operation. The oil was processed under 350 pounds pressure at 950° F., yielding 74.3 per cent of 378° F. endpoint gasoline, 19.1 per cent of flashed residue, and 6.6 per cent of gas including loss.

The gasoline obtained from the cracking of the Kettleman Hills crude had an octane number of 75. The gravity and distillation analysis of the gasoline follows:

A.P.I. grav.	59.6
Init. b. p., °F.	104

A.S.T.M. 100 c.c. Distillation

Pct. distilled over	Temp. °F.
5	143
10	163
20	191
30	212
40	234
50	252
60	271
70	290
80	311
90	345
95	365
Endpoint	378
Per cent over	94.0
Octane number	75

A summary of product yields from the cracking of Kettleman Hills crude oil under the above conditions is given in the table:

Gasoline (% of crude)	74.3
A.P.I. gravity	59.6
Flashed residue (% of crude)	19.1
A.P.I. gravity	1.2
Gas and loss (% of crude)	6.6
Gas (cu. ft. per bbl. of crude)	408

Cracking Kettleman Hills Topped Crude

The topped crude remaining after removal of the 375° F. endpoint gasoline from Kettleman Hills crude represented 62.1 per cent of the original oil. This topped crude was subjected to cracking conditions under the flashing method of operation and yielded 58.6 per cent of gasoline (36.4 per cent based on the crude) having an octane number of 80.

The topped crude used as charging stock for these cracking tests analyzed as follows:

Gravity	28.3
Flash (Cleveland o. c.) °F.	190
Fire (Cleveland o. c.) °F.	215
Flash (Pensky-Martens) °F.	165
Viscosity, Furol, at 77° F., sec.	15
Cold test, °F.	30
Sulphur, per cent	0.40
B. s. and w., per cent	0.6
Init. b. p., °F.	388

A.S.T.M. 100 c.c. Distillation

Pct. distilled over	Temp. °F.
5	422
10	442
20	478
30	508
40	544
50	590
60	648
70	678
80	696
90	712
	Pct.
Over at 392° F.	1.0
Over at 410° F.	3.0
Over at 437° F.	8.0
Over at 572° F.	46.5

The above topped crude was subjected to cracking under 350 pounds pressure at 950° F., yielding 58.6 per cent of gasoline, 31.0 per cent of flashed residue, and 10.4 per cent of gas including loss. The amount of gas was 584 cubic feet per barrel of topped crude. These yields, calculated back to the original crude, are tabulated below in conjunction with the yield of straightrun gasoline from atmospheric distillation.

SUMMARY OF PRODUCTS

	Pct. of crude
Gasoline (straightrun) 375° F., e.p.	37.2
Gasoline (cracked) 375° F., e.p.	36.4
Flashed residue	19.5
Gas and loss (cracking)	6.6
Distillation loss (topping)	0.3
Gas (cu. ft. per bbl. of crude)	363

The cracked gasoline obtained from conversion of Kettleman Hills topped crude had an octane number of 80. The cracked gasoline showed the following distillation characteristics:

CRACKED GASOLINE

Gravity, A.P.I.	59.8
Sulphur, per cent	0.12
Init. b. p., °F.	97

A.S.T.M. 100 c.c. Distillation

Pct. distilled over	Temp. °F.
5	129
10	148
20	178
30	205
40	230
50	252
60	274
70	296
80	316
90	341
Endpoint	374

Octane number, 80.

Blending the cracked gasoline with the straightrun product in the proportions in which they were obtained from the crude yielded a gasoline representing 73.6 per cent of the crude, with an octane number of 72.

The flashed residue from the cracking process produced an excellent fuel, showing the following properties:

FUEL OIL

A.P.I. grav.	3.0
Flash (Cleveland o. c.) °F.	225
Fire	290
Flash (Pensky-Martens) °F.	180
Viscosity Furol at 122° F.	200
Cold test, °F.	55
B. s. and w., per cent	0.2
Init. b. p., °F.	434
Over at 572° F., per cent	16.5

The direct cracking of Kettleman Hills crude and topping the crude and cracking the fuel oil, then blending the straightrun and cracked gasoline, are summarized in the table:

Operating Conditions	(1)	(2)
Pressure (lbs./sq. in.)	350	350
Temp., °F.	950	950
Gasoline		
Per cent by vol. of crude	74.3	73.6
A.P.I. grav.	59 6	58.2
Endpoint, °F.	378	375
Octane number	75	72
Residuum		
Per cent by vol. of crude	19.1	19 5
A.P.I. grav.	1.2	3.0
Gas		
Cu. ft. per bbl. of crude	408	363
Gas and Loss		
Per cent by vol. of crude	6.6	6.9

(1) Cracking the crude oil direct.
(2) Cracking topped crude blending the straightrun and cracked gasoline.

It is interesting to note that the single operation involved in cracking Kettleman Hills crude direct yields 74.3 per cent of 378° F. endpoint gasoline of 75 octane number, whereas the blend of straightrun and cracked gasoline, representing 73.6 per cent of the crude, showing an octane number of 72, has been obtained through three steps instead of one —topping, cracking and blending.

Wide Difference in Design of Pure Oil Company's New Absorption Plants

* * * * * *

By A. E. Harnsberger
Pure Oil Co.

The past five years have seen a tremendous development in refinery gas absorption plants. The increased use of cracking processes, the reforming of straightrun gasoline and the necessity for lowering vapor pressures of motor fuels have all had an important bearing. In addition, the economic situation has made it necessary that the waste brought about by the presence of gasoline fractions in the gases being burned in the refinery be eliminated. These gasoline fractions, having a high octane number, are needed in order to produce good motor fuel, and at the same time their removal permits the burning of larger quantities of heavy oil in the plant, and thereby removes a certain amount of this from the market.

During the past three years, all of the compression type recovery plants in the refinery division of the Pure Oil Co. have been changed over to absorption type plants. In some cases, the pressures were reduced and approximately 40 per cent increase in compressor capacity obtained without additions to compression equipment. This was accomplished by reducing discharge pressure from approximately 175 pounds to 65 pounds.

The absorption plant and instrument designers deserve a great deal of credit for the advances they have made in supplying equipment suitable for refinery conditions. Considering the variations which occur in oil gas manufacture, it is remarkable that absorption plants can operate so successfully. From hour to hour there may occur large variations in gas volumes. Variation in stream temperatures and variation in oil line temperatures also causes a constantly changing quality of gas passing to the recovery system.

The Pure Oil Co. has installed recovery systems in six of its seven refineries. Although all of these plants present interesting features, two of them are outstanding on account of their wide differences in design and operation necessary in order to have them perform properly as part of the general refinery setup.

One of these plants, located at Smiths Bluff, Tex., was installed during a general revamping of the recovery system and, therefore, had to be "tailor made" in order to suit the various conditions as existed at the time. The second plant to be described is more in the nature of a standard layout operating at high pressures in order to permit the manufacture of constituents such as butylene and propylene, which are available from the gases produced by the Gyro units. The pressure is also utilized for long distance transmission of the stripped gas sold to commercial users.

The Smiths Bluff, Tex., plant will be described first. The absorption end of the equipment was furnished and erected by the Foster Wheeler Corp. during the spring of 1931. The plant receives oil gas from a number of sources, the principal ones being as follows:

Depending upon weather conditions, up to 1,250,000 feet of receiving house and tank vapors are gathered by a vacuum system and compressed to 35 pounds gauge pressure. Approximately 4,000,000 feet of gas is produced by the Cross cracking still battery under a pressure of 35 pounds. This gas is removed from the separators and mixed with the receiving house and tank gases, and passed into the low pressure absorber shown on the flow sheet. This absorber is 60 inches in diameter and 56 feet high and equipped with 20 bubble plates.

* * * *

Approximately 8,000,000 feet of wet gas at 5 pounds gauge pressure is produced by the Gyro process. This gas is compressed to 65 pounds gauge pressure by means of six Bessemer, 175 b.h.p., two cycle gas engine driven compressors equipped with duplex, single-stage compression cylinders. After cooling, this gas is passed through the high pressure absorber shown on the flow sheet. This absorber is 66 inches in diameter and 56 feet high, containing 20 bubble plates.

The oil rates on these two absorbers are varied with the season, varying from 54 gallons per 1,000 feet of gas entering to 68 gallons in the case of the low pressure absorber, and from 32 to 38 gallons in the case of the high pressure absorber.

Representative Operating Conditions

	Pressure	
	Low cubic ft./hr.	High cubic ft./hr.
Wet gas to absorber	214,000	300,000
Dry gas from absorber	174,000	232,000
Sp. Gr. dry gas from absorbers	1.04	.965
Wet gas to absorber, °F.	90	87
Dry gas from absorber, °F.	100	99
Water to intercoolers, °F.	73	73
Lean oil to absorber, °F.	86	86
Fat oil from absorber, °F.	108	109
Lean oil to absorber, g.p.h.	11,450	10,985
Lean oil rate	53.5	36.6
Pressure, lbs.	32	62

Under above conditions, analysis of gases to and from the absorbers showed the following results:

Gas to Low Pressure Absorber

	Pct.
C_1 Comp.	31
C_2 Comp.	21
C_3 Comp.	22
C_4 Comp.	16
C_5 Comp. and heavier	10

Gas from Low Pressure Absorber

	Pct.
C_2 Comp. and lighter	94.5
C_3 Comp.	5.2
C_4 Comp.	.3

Wet Gas to High Pressure Absorber

	Pct.
C_1 Comp.	38
C_2 Comp.	28.2
C_3 Comp.	19.8
C_4 Comp.	9
C_5 Comp.	5

Dry Gas from High Pressure Absorber

	Pct.
C_3 Comp. and lighter	95.9
C_4 Comp.	4.1
C_5 Comp.	0

The fat oil from both of these absorbers is removed by separate steam driven pumps, each under control of a liquid level controller.

The combined stream of these two pumps passes through two heat exchangers countercurrent to the lean oil flow. After passing through these exchangers, the fat oil is delivered to the first devaporizer, which operates at a temperature of approximately 200 degrees and a pressure of 75 pounds. A small overhead cut is taken from this devaporizer. The oil then passes through a third heat exchanger exchanging heat against the hot lean oil flowing from the still, and then flows to the second devaporizer at a temperature of approximately 260 degrees and a pressure of 60 pounds. An additional cut is taken off of the fat oil at this point.

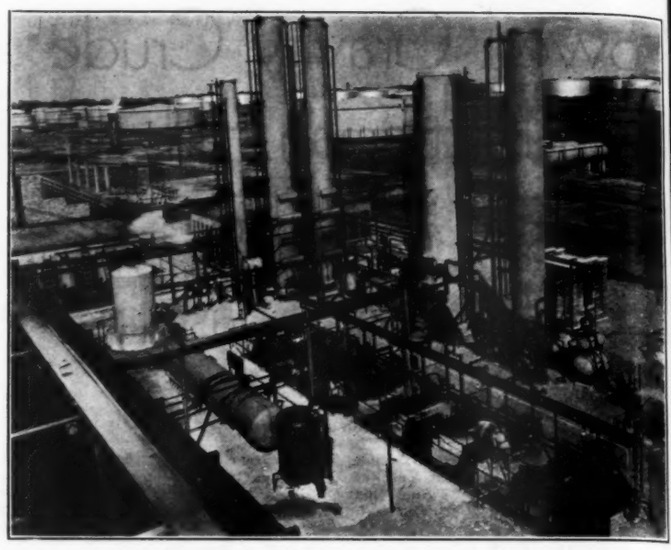
The combined cuts of the two devaporizers are conducted to a water cooler and the gas and condensate passed to a secondary absorber operating at 50 pounds pressure. Lean oil is introduced into this secondary absorber at a rate sufficient to produce a dry gas from the top practically free of C_3 fractions and with from 25 to 30 per cent C_4 fractions. The flow of gas from this absorber averages 750,000 feet a day and is burned along with the other dry gases from the main absorbers. The fat oil from this absorber is drained through a level controller to the low pressure absorber without pumping.

The total fat oil flow, having been stripped of the lightest fractions in the devaporizers, is passed through a preheater where its temperature is raised from 260 degrees to 310 degrees. Hot recycle stock, having a temperature of 525 degrees from the Cross cracking still battery, is used for this preheating operation. The hot fat oil is then introduced into the still, which operates at a pressure of 25 pounds gauge. This still is provided with internal heaters, which also utilizes hot recycle stocks as a heating medium.

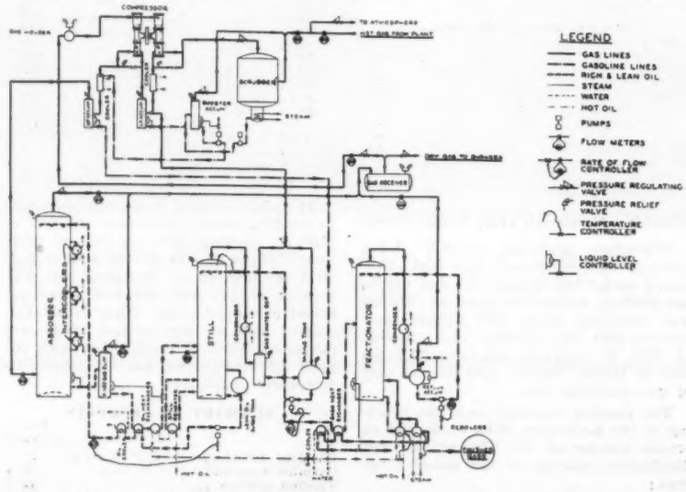
Sample Operating Data Foster Wheeler Still at Smiths Bluff

Fat oil inlet, °F.	301
Bottom of still, °F.	311
Top of still, °F.	190
Pressure of still, lbs.	25
Lbs. of steam to still, lbs. per hr.	3,315
Gas from water separator, M/hr.	13.2
Quantity of lean oil from still, gals.	23,330

On account of the low condensing pressure of 25 pounds, a rich gas is produced off of the water separating tank, and this is recompressed by means of a small booster compressor and passed through the secondary absorber where it is stripped of gasoline fractions. This recompression is justified in view of the economies effected by using low pressure exhaust steam in the still for stripping purposes. The initial of the lean oil is maintained at approximately 350° to 375° F. The lean oil flows from the still by gravity through the heat exchanger provided for use in connection with the second devaporizer, and then into a lean oil surge tank, which is maintained under pressure of a few pounds above atmospheric. At this point, the oil is picked up by a 4-inch two-stage centrifugal hot oil pump driven by a 75-horsepower explosion-proof motor. This pump provides a discharge pressure of 125 pounds and



General view of absorption plant at the Smiths Bluff, Texas, refinery.



General layout of absorption plant equipment at the Toledo refinery of the Pure Oil Co.

delivers the oil through the remaining two fat oil exchangers and the lean oil water cooler. The oil is then delivered through ratio controllers to the three absorbers, completing the cycle.

The raw gasoline produced in the surge tank is preheated and charged to a stabilizing column, operating at 150 pounds pressure, in the conventional manner. Preheating is provided by exchange against the stabilized bottom product and with additional heat provided by high pressure steam.

Sample Operating Data, Foster Wheeler Stabilizer at Smiths Bluff

Raw feed, gals./hr.	2,439
Reflux, gals./hr.	2,268
Kettle temperature, °F.	234
Top temperature, °F.	121
Gas from reflux accumulator, M/hr.	11
Spr. gr. gas from reflux accumulator	1.502

Under the above operating conditions the following analyses were obtained:

Gas from Reflux Accumulator

	Pct.
C_3 Comp. and lighter	60.5
C_4 Comp.	39.5
C_5 Comp.	0

Gasoline from Bottom of Stabilizer

C_3 Comp. and lighter	0
C_4	26.8%
C_5 and heavier	73.2%
A.P.I. gravity	81.2°
Vapor pressure, lbs.	25 4
Recovery	91%

Reflux is pumped back at a constant rate in sufficient quantity to give a 6 to 1 ratio. A source of supply is obtained by reflux partial condensers and an accumulator. Level in the accumulator is maintained by controlling the water supply to the reflux condensers.

The plant regularly handles 13,000,000 feet of gas per day and has handled 14,500,000 feet. Normally, a yield of between 4½ and 5 gallons per 1,000 feet of wet gas processed is obtained, producing as high as 70,000 gallons per day of stabilized gasoline. Cooling is provided by a 4,000-gallon per minute capacity cooling tower located alongside of the plant. This tower is 147 feet long, 17 feet wide and 38 feet high, and provides cooling water within 5 degrees of wet bulb temperature during summer months, except in cases of complete air stagnation.

For heating, approximately 6,000 bbls. per day of hot recycle oil is consumed, the oil entering the plant at 525 degrees and leaving at approximately 325 degrees. The total high pressure steam requirements for all purposes, including pumps and stabilizer preheating, is 5,000 pounds per hour. Of the pump exhaust, from 3,000 to 3,500 pounds per hour are used for stripping purposes in the still. When a source of hot oil for heating is available, the installation of low pressure absorbers, as above described, are justified, since the use of steam can be kept down to a nominal quantity in spite of the large volume of oil circulation required which, in the case of this plant, averages 25,000 gallons per hour.

The absorption plant at this refinery is capable of processing 7,500,000 feet a day of gas from Gyro cracking stills. The equipment for the absorption end of the plant was furnished complete and erected by the Jackson Engineering Co. Gas is generated on the Gyro process at a pressure of 3 pounds gauge. It is then compressed to 175 pounds gauge by means of four 325 b.h.p. rated Worthington, four cycle, duplex gas engine driven compressors. Two stage compression is resorted to in this case, the condensate of the intermediate accumulator is being pumped into the high pressure gas coolers, as indicated by the flow sheet. Condensate from the high pressure accumulator is withdrawn and allowed to flow by gravity into the raw gasoline storage tank of the absorption system, which is maintained at approximately 70 pounds pressure.

Under normal operating conditions, the wet gas to the compressors analyzes as follows:

	Pct.
Methane, hydrogen and air	24 4
Ethylene	23.1
Ethane	12 5
Propylene	14.9
Propane	6.1
C_4 Comps.	10 9
C_5 Comps.	4 7
C_6 Comps.	3.4
Specific gravity, °F.	1 23

After compressing to 175 pounds, and under average cooling water conditions, the gas passing to the main absorber analyzes as follows:

	Pct.
C_1 Comps.	31.2
C_2 Comps.	42.8
C_3 Comps.	14 3
C_4 Comps.	7 8
C_5 Comps. and heavier	3 9

From the high pressure accumulators the gas enters the main absorber of the plant, which operates normally as follows:

Gas to absorber, cu. ft./hr.	165,000
Gas from absorber, cu. ft./hr.	129,000
Temp. of gas in	64°
Temp. of gas out	77°
Temp. of oil out	73°
Pressure, lbs.	165
Lean oil to absorber, gals./hr.	1,650
Oil rate, gas./M.	10

Under the above operating conditions, gas from the absorber analyzes as follows:

	Pct.
C_3 Comps. and lighter	98 2
C_4 Comps.	1.8
C_5 Comps.	0
Specific gravity	.917

The above absorber is 42 inches in diameter by 53 feet high and contains 22 bubble plates. Three outside intercoolers are provided for use during warmer months. The fat oil is drained from the bottom into a fixed gas eliminator operating at 100 pounds pressure. Approximately 50,000 feet a day of gas is vented from the eliminator into the burning system. A typical analysis of the gas from the fixed gas eliminator follows:

	Pct.
C_3 Comps. and lighter	90.19
C_4 Comps.	9.81
C_5 Comps.	0
Specific gravity	1.168

The fat oil is then exchanged against hot lean oil flowing from the still and further preheated in a second set of exchangers against hot recycle oil pumped from the Gyro units. This raises the fat oil to a temperature of approximately 325 degrees, and it is then introduced into the single still. This still is 42 inches in diameter by 40 feet high. General operating conditions of the still are as follows:

Fat oil in, °F.	325
Kettle, °F.	350
Vapors overhead, °F.	196
Steam for stripping, lbs./hr.	370
Operating pressure, lbs.	70
Fixed gases from still separator, cu. ft./hr.	17,500

The fixed gases from the still normally contain about 1½ gallons per 1,000 feet of recoverable gasoline fractions. There is also vented from raw gasoline storage tank a small amount of gas. This is caused by the breakdown from 175-pound accumulator to the 70-pound raw gasoline storage pressure. The above two gases are combined and recirculated back to the intermediate stages of the main compression units.

The hot lean oil drains from the bottom of still into a balance tank operating at the same pressure as the still. Suction is taken from this tank by a steam pump designed for handling hot oil and delivered, first, through the fat oil exchangers and then through final water coolers before entering the absorber.

Raw gasoline is stabilized in a column 42 inches in diameter by 47 feet high, containing 28 bubble plates. This column is designed for an operating pressure of 250 pounds. The raw feed under control of the rate of flow instrument is preheated and enters the side of the column. Two kettles for maintaining bottom temperature are provided—one using high pressure steam as a source of heat and the second hot recycle oil. A definite reflux ratio is maintained in the conventional manner by pumping back reflux material obtained by condensing part of the overhead by means of reflux condensers. Some analyses of samples of material from this stabilizer were taken recently under the following operating conditions:

Rate of feed, gals./hr.	2,520
Rate of reflux, gals./hr.	1,800
Feed in, °F.	155
Kettle, °F.	228
Reflux out, °F.	112
Operating pressure, lbs.	181
Gas from reflux accumulator, ft./hr.	37,400

The stabilized gasoline, flowing from column, analyzed as below:

C_3 Comps.	0
C_4 Comps.	29.5%
C_5 Comps. and heavier	70.5%
Reid vapor pressure, lbs.	26 2
Recovery	90%
A.P.I. gravity	79.7°

Gas overhead from the reflux accumulator analyzed as follows:

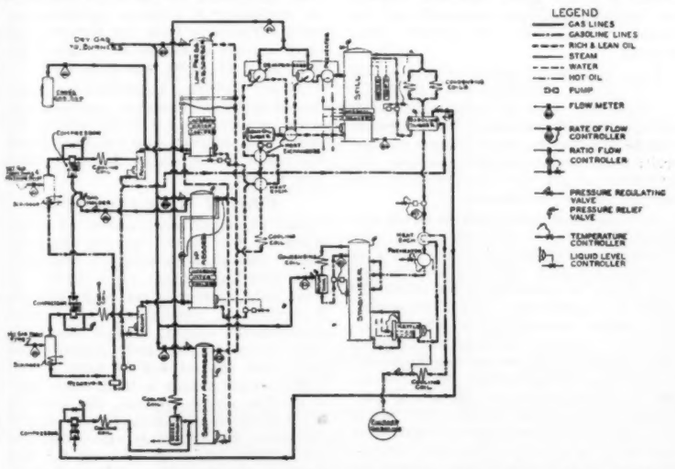
C_3 Comps. and lighter	66 9%
C_4 Comps.	33.1%
C_5 Comps.	0
Specific gravity	1.336

When processing 7,500,000 feet of wet gas per day, the gas engines burn approximately 3 per cent of this quantity, or 225,000 feet of dry gas having a B.t.u. value of approximately 1,500 per cubic foot. The entire plant requires 2,500 pounds of steam an hour for distillation purposes, pumps and heating. The water consumption for all purposes, including gas engines under average temperature conditions of 60° F., is 1,000,000 gallons per day. Bay water is being used and necessitates frequent back-washes through closed condensers at certain periods of the year. This has been provided for, however, in a way that causes very little trouble to operations.

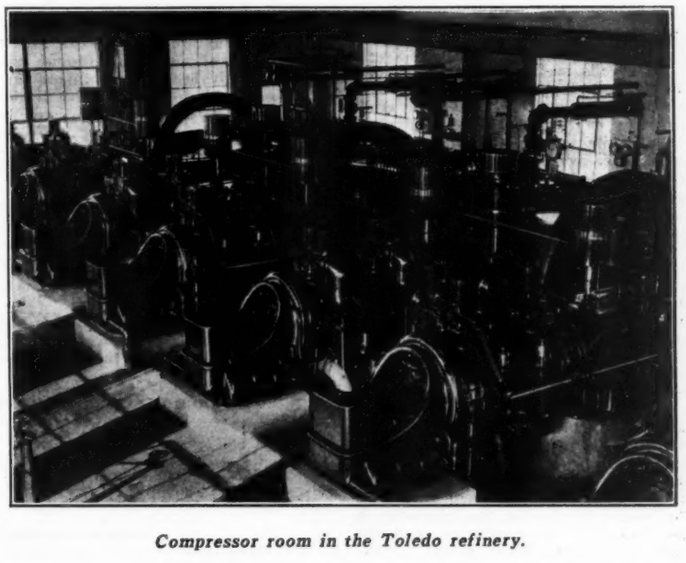
The high pressure being employed in this plant results in a low lean oil rate and low steam and water consumption. Opposed to this, however, is the large horsepower required for compression of the gases from slightly above atmospheric to 175 pounds pressure. Pressure, however, is advantageous in that it facilitates the manufacture of either butylene or propylene. It also provides a means of disposal of the dry gases from the plant through pipe lines to an industrial concern located some miles distant, which is at present being carried out. These factors led up to the decision for utilizing high pressure in this plant.

On account of the large production of gasoline from the various plants, it has been advisable to maintain a close system of daily checks on their operation. A complete metering system of wet gases to and dry gases from is maintained. These meters are read daily and from them the weight of wet gases to and dry gases from is calculated, and the difference in pounds is converted into gallons of gasoline production, which is checked against the actual production measured in the stock tanks. The theoretical gallons generally calculates higher than the actual gallons of production because of water of condensation which is not measured but drained. It provides, however, a method of obtaining an operating loss and a check against leaks and faulty metering equipment.

Operation of the plants are also controlled by monthly test samples of the dry gases and gasoline produced. These samples are shipped to a central point and analyzed by the Podbielniak method. The results are used in determining lean oil rates, reflux ratios, temperatures and pressures necessary to obtain the maximum recovery of a stabilized product from the wet gases.



Flow chart showing equipment layout for the absorption plant of the Pure Oil Co. at its Smiths Bluff, Texas, refinery.



Compressor room in the Toledo refinery.

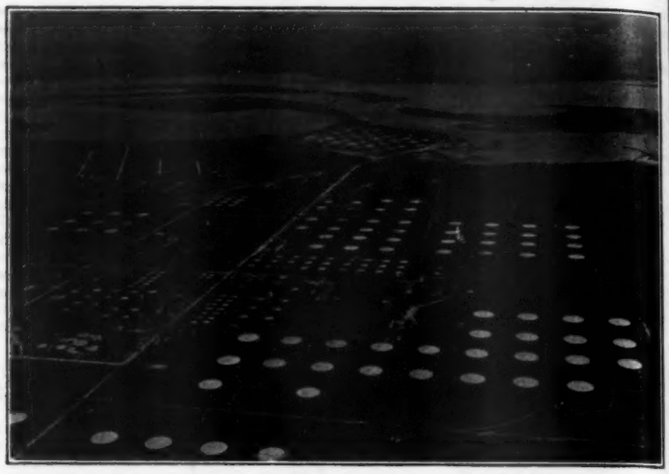
Metal Losses in Condensers and Tried Methods for Combating Corrosion

* * * * * *

By Sherman S. Shaffer and John Pollock
Humble Oil & Refining Co.

General refinery corrosion was discussed in a paper by Brian Mead in The Oil and Gas Journal of December 8, 1927. The following paper is a continuation of that work, with special reference to condensers.

In the operation of crude and rerun batteries, replacement of condensers often forms a considerable item in the cost of distillation, which in turn figures in the cost of the finished oil. Corrosion of such equipment is too often taken for granted as the result of operating on certain crudes and very little, if anything, is done to counteract such corrosion unless the measures taken have some direct bearing on operation.



Airplane view of 125,000-bbl. plant of Humble Oil & Refining Co. at Baytown, Tex.

* * * *

Many of the condensers on streams from atmospheric batteries are of the coil type, consisting of cast iron pipe laid in rows 30 to 40 feet long, 12 to 14 rows deep and the same number in width, arranged, in general, in parallel flow from a common header with one or more intermediate headers before the various flows are combined to form a common outlet stream. The coil is usually constructed in a rectangular box, the cooling medium being water. The corrosion of such a coil must be considered then from the point of view of (1) external conditions, (2) internal conditions or nature of the condensation products inside the coil, and (3) the protection to be afforded where corrosion is severe.

Conditions Affecting Coils

Such coils may be employed for condensing oil vapors ranging from light naphthas to cracking stocks on crude batteries or light naphtha from rerun stills, while the cooling water may be fresh, salt, recirculated or recovered according to local conditions, and the temperature may range from that of the incoming cooling water to its boiling point. External corrosion will therefore vary with the water used; it will generally be expected to be less severe with fresh than with salt water; it will also depend on the condition of the water—aeration and temperature being two important factors. Oxygen and carbon dioxide are known to be promoters of corrosion, while high temperatures will tend to accelerate any chemical effect.

Internal corrosion will be caused, not so much by the various oils themselves since the hydrocarbons in the pure state are very unreactive chemically, but by the impurities which they contain; the nature of the impurities will vary with the source of the oil, the treatment it had had prior to distillation, and the conditions holding during actual distillation and condensation.

Corrosion, under the usual condenser conditions, does not take place unless water is present. Crude oil contains water and this in turn contains the substances which make the water "salt." The two substances regarded as most harmful are the chlorides of calcium and magnesium, since in the presence of water their decomposition by means of heat produces hydrochloric acid. This acid on condensation in the presence of water naturally exerts its solvent action on any material, metallic or otherwise, with which it comes in contact. Hydrogen sulphide is present in varying amounts in the crude oil distillates; this again is corrosive in the presence of water and is given off during the distillation of the crude oil. Such corrosive agents are always present to some extent in the straightrun naphtha.

When heavier cuts such as kerosene, gas oils and cracking stocks are distilled, the use of steam is resorted to. Under such conditions sulphur compounds break down, producing hydrogen sulphide; the steam may contain oxygen and carbon dioxide, corrosive agents of no mean importance.

Acid treated naphtha is likely to contain sulphuric acid esters or sodium salts of organic sulphur acids which on breaking down under the action of steam and heat in rerunning, produce acidic substances of which the most corrosive is probably sulphur dioxide.

In addition, the corrosive action of such substances would be affected by temperature, being greater with rise in temperature. Another factor, though not of a corrosive nature but contributing to general loss of metal, is erosion; this cannot usually be measured in ordinary equipment subjected to corrosive liquids but its effect would probably not be large unless accompanied by corrosion where scale would alternately be formed and washed away, thus hastening deterioration.

The conditions mentioned, although not intended to be exhaustive in number, indicate the complexity of the subject and the impossibility of having the same conditions in any two cases.

External Conditions

The external conditions affecting the coils will be considered first. In general, it might be assumed that the external or water corrosion would be less severe than the stream corrosion, yet with so many factors present occasioned by the source of water supply and the difference of conditions of operation of the (condenser) boxes, some actual measurement seems desirable for comparative purposes. Especially is this so since certain effects may be negligible compared with the more corrosive streams but become significant compared with the lesser corrosiveness of certain other streams.

Even in such an action as that of water on metals, conditions can vary greatly, especially over a large number of units. Actual corrosion of equipment will be affected by such factors as composition of the water, hydrogen ion concentration of pH value, temperature, and position in the installation.

In attempting to obtain data on corrosion losses due to the water, test strips of metal were suspended in the water at a depth of 4 to 6 inches below the surface except in those instances where the depth is specifically stated otherwise. Such strips, cleaned and weighed before and after exposure, provide an approximate indication of the service to be obtained from various metals or of the action of the water in the case of any particular metal. Such results will be to some extent dependent on the duration of the test since in actual practice, scale or corrosion products may build up and afford some protection to the underlying metal; on the other hand, such products may be the means of accelerating the corrosion rate. The difference between such tests and actual practice is that in the latter the scale is rarely, if ever, removed from the pipes. Test strips (3½"x1"x⅛") were usually exposed over a period of 90 days. The strips used were of cast iron, representative of the material used in construction, and tank steel as a reference standard; in some of the later work, steel of A.S.T.M. specification A-30-24 (locomotive fire-box steel) suggested by the A.P.I. committee on corrosion of refinery equipment under its Tentative Code for Determination of Resistance to Corrosion of Metal Samples, May 24, 1930, was also used.

Actual operating conditions were made use of for test exposures, analyses being made of the water for the constituents under consideration and temperatures being taken for determination of temperature effect.

Effect of Water Composition

The principal local source of cooling water is bay water, usually designated "salt," though it is really a mixture of salt water and fresh river water. Its total solid content is not really high and it cannot be considered a particularly objectionable supply, though since it is drawn from comparatively shallow water, its oxygen content will be high.

The second supply is fresh water which is used in closed systems, the water being passed over cooling towers and recirculated, the necessary amount of fresh water being added as make-up for evaporation and other losses. In such a system, small quantities of oil are usually present in the water owing to occasional leakage from condensers.

Table 1 shows the average effects for recirculated, salt, and a third supply, which is a mixture of salt and recovered fresh water, for temperatures approximating 146° to 173° F.

The recirculated water shows a very low corrosion rate; besides being low in total solids, it contained traces of oil and was found to be free from oxygen, two factors which undoubtedly contributed to this low corrosion rate.

Effect of Temperature

Table 2 indicates the effect of temperature, a direct correspondence being shown between average temperatures and the penetration shown by tank steel, the higher temperatures being responsible for the greater corrosion, but the relation in the case of cast iron is not quite so good.

Effect of Temperature, Oxygen Content of Water and Position in Installation

Observation of equipment shows that the top rows of a coil suffer most. This effect will naturally be associated with the temperature gradient of the water in the box, but temperature is not the only factor, since the oxygen content of the water at different heights has been found to vary.

Table 3 shows the results obtained at different heights in a box; the general

TABLE 1—EFFECT OF WATER USED ON CORROSION RATE

Description—	Water used: Quantity gals./day	pH	Total solids gms./lb.	Oil content gms./lb.	Oxygen content cc./lb.	Aver. penetration, inches/year: Steel (tank)	Cast iron
Recirculated	3,900,000	8–9	0.5–0.7	1–2	...	.0002	.0002
Salt	1,600,000	7–8	5–6	...	...	.012	.012
Salt-recovered	1,900,000	8–9	4–5	...	4–5	.008	.008

TABLE 2—EFFECT OF TEMPERATURE

Conditions—Immersion, 4-6 inches below surface; water, salt; temperatures, 143°-158° F. Length of test—78 days.

Condenser box No.	Temperature: Max.	Min.	Av.	Average penetration, inches/year: Tank steel	Cast iron
1	159	130	148	.0107	.0134
2	166	123	146	.0109	.0115
5	168	122	150	.0115	.0154
6	160	104	153	.0134	.0120
7	178	100	160	.0134	.0126
9	156	101	143	.0097	.0113

TABLE 3—TEMPERATURE, OXYGEN CONTENT AND POSITION

Conditions—Immersion at various depths; top, 4-6 inches below surface; middle, approximately half way between the bottom of the box and the surface of the water; bottom, about 1 foot from the bottom of the box; water, salt, 15.9 gms. T. S./lbs., chiefly sodium chloride, pH 8-9.
Length of test—95 days.

Position of test—	Average temp., °F.	Av. oxygen content cc./liter	Av. penetration, inches/year: Tank steel	Wrought iron	Cast iron
Incoming water	66	4.4	....	....	....
Bottom section	83	1.4	.0027	.0038	.0032
Middle section	100	2.4	.0044	.0044	.0040
Top section	137	2.7	.0073	.0064	.0055
Overflow	134	3.0	....	....	....

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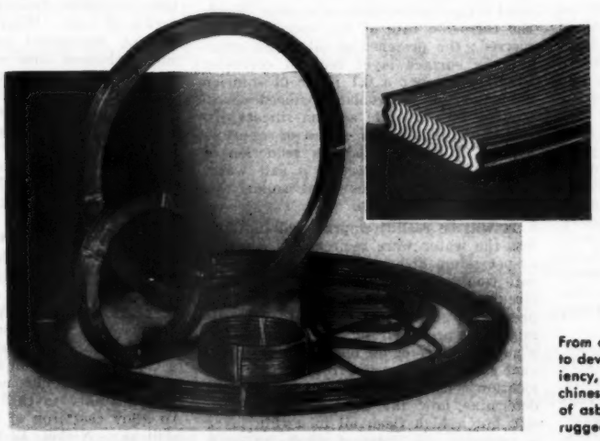

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conclusion may be drawn that higher temperatures coupled with higher oxygen content undoubtedly causes higher corrosion rates.

Internal Conditions

Owing to the number of crudes usually processed, the internal corrosion of the various condensing units will be by no means uniform. Contributing to this variation will be the varying sourness of the crudes, the method of distillation (dry or wet), the number of distillates or fractions taken from a crude, the formation or breakdown of compounds formed in treating and incomplete removal before redistillation, and, where cracking is considered, the formation of decomposition products of a corrosive nature.

Experimental determination of the corrosiveness of various streams was attempted by suspending weighed metal test strips in the streams at the look boxes in the receiving house, and determining the loss in weight on cleaning after exposure. This location and the rundown tank are the only places readily accessible for such tests, and, since the conditions at the point of inspection may be vastly different from those inside the coil, it will be realized that prediction of the life of condensing equipment by such means has its limitations. However, it was hoped that although the temperature at the look box would be lower than in the coil, the erosion by the stream and the action of the condensed water, which was rarely completely separated before that point, would give some idea of the losses experienced in the preceding equipment.

Streams from two crudes, light West Texas and Reagan, and from rerunning acid treated naphtha were checked in that manner and the calculated life of the coils compared with the average life obtained in service. Unfortunately, the West Texas crude was switched after eight days' exposure of test strips, a period too short for reliable results; however, both crudes exhibited increasing corrosiveness through the naphtha streams, reaching a maximum with the kerosene and then a decrease through gas oil and cracking stocks.

Table 4 shows the calculated life for individual coils using the penetration values for cast iron as obtained from the stream tests, the value of 0.012 inch per year for the salt water corrosion on the crude batteries, 0.008 inch per year on the rerun battery, and the material thickness of 0.5 inch, assuming uniform and complete disintegration. With the values shown may be compared the average life of 4.5 years in the service of light streams (naphtha), 10 years or more for heavy distillates (kerosene and heavier) from crudes, 4.7 years in light naphtha service from redistillation of acid treated stocks, and 6 years or more in that of heavy naphtha from untreated cracked stocks.

Knowing the approximate life of the coils and the average cost of dismantling the old and installing new coils, it is possible to obtain a figure for annual replacement charges. Allowing, say, 6 per cent simple interest on an average cost for replacement over a period of 4 years will give annual replacement charges. This places a value on the service being obtained from a coil, from which, when compared with noncorrosive services, the cost on account of corrosion on this one item alone can be determined.

Iron Losses as a Measure

Before considering means of protection, a second method which can be used as a measure of corrosion suffered by condensers will be considered. In those places where the streams can be measured and the incoming stream contains no iron or a known constant amount, analysis of the outgoing stream for iron will furnish iron losses suffered by the equipment traversed.

Naphtha condensates from crude invariably contain hydrochloric acid during distillation; this acid dissolves in the water rather than in the naphtha and examination of the iron losses from condensers has shown 75 to 95 per cent of the iron loss to be present in the condensed water.

TABLE 4
Crude Service

Coil	Light West Texas crude — Distillate	Average penetration inches/year	Calculated life, years	Reagan crude — Distillate	Average penetration inches/year	Calculated life, years
No. 1	Naphtha	.022	14.7	Naphtha	.023	14.3
No. 2	Naphtha	.020	15.6	Naphtha	.077	5.6
No. 3	Naphtha	...	...	Naphtha	.138	3.3
No. 5	Naphtha	.230	2.1	Kerosene	.074	5.8
No. 6	Kerosene	.523	0.9	Kerosene	...	...
No. 7	Kerosene	.098	4.5	Light paraffin distillate	.004	31.2
No. 9	Cracking stock	.001	38.4	Cracking stock	.002	35.7

Rerun Service

Coil	Distillate	Average penetration, inches/year	Calculated life, years
No. 1	Light naphtha from acid treated stock	0.164	2.9
No. 2	Light naphtha from acid treated stock	0.180	2.7
No. 3	Light naphtha from acid treated stock	0.194	2.5
No. 12	Heavy naphtha from untreated stock	0.013	23.8

TABLE 5—RELATION BETWEEN IRON LOSS AND WATER CONTENT OF CRUDE

Charge rate: 35,000 gallons per hour

Charge stock	Water % on crude	Hydrochloric produced, lbs./day	Iron loss lbs./day	Iron loss per 0.1% water lbs./day
Light West Texas	.240	125.8	129.7	54.1
Light West Texas	.172	121.9	121.9	70.8
Light West Texas	.039	25.4	31.1	65.0
Light West Texas average	...	....	....	61.7
Light coastal	.220	....	33.5	15.2
Light coastal	.192	....	17.0	8.9
Light coastal	.176	....	13.7	7.8
Light coastal	.106	12.6	15.5	14.6
Light coastal	.065	3.0	3.0	4.6
Light coastal	.057	2.6	2.6	4.6
Light coastal	.044	2.0	2.0	4.5
Light coastal	.028	2.1	2.0	7.1
Light coastal	.022	1.8	1.9	8.6
Light coastal average	...	...	...	8.4

TABLE 6—EFFECT OF ANHYDROUS AMMONIA ON IRON LOSS

Charge stock	Anhydrous ammonia — Lbs./day	Lbs./1,000 barrels crude	Per cent of calc. theoretical requirement*	Iron loss — Without ammonia	With ammonia	% reduction
West Texas	69.0	3.5	540	31.7	6.5	79
Coastal	8.5	.4	145	15.0	3.8	75
Coastal	8.5	.4	145	15.0	3.4	78

*Based on chloride present.

The figures shown in Table 5 give the amount of hydrochloric acid produced from two crudes, light West Texas and coastal, when distilled in a pipe still, as indicated by the chloride present in the water in the light naphtha condensate, the daily iron loss from the condenser and the relation between iron loss and the water present in the crude. It will be seen that the iron loss is roughly proportional to the acid produced, though for the two crudes its relation to the amount of water present is vastly different. This may be accounted for by the greater salinity of the water accompanying the West Texas; on the other hand, in processing the West Texas crude, 0.85 pound of H_2S-sulphur per barrel was evolved while only 0.014 pound per barrel was evolved from the coastal crude. The effect in the latter case is probably that the hydrochloric acid, being more corrosive than the hydrogen sulphide, dissolves iron until it is almost exhausted; then the hydrogen sulphide comes into greater prominence, precipitating iron from solution and releasing, by double decomposition, hydrochloric acid, so that in the presence of a large excess of hydrogen sulphide the action may go on indefinitely. Water provides the medium for these reactions; hence, if it remains in the system, the acids continue to react with the iron equipment until exhausted.

It can thus be appreciated that the condensed water by virtue of its acid impurities contributes enormously to the destructive action not only to the condensers but to rundown lines, accumulators, receiving house equipment, valves, rundown tank bottoms, pumps and pump lines; in those places where wash is used on the tower, inadequate separation of water from the naphtha returned shows its effect on wash pumps, lines and the top plate of the tower.

The question naturally arises as to how this corrosive action can be overcome.

Protection—External

The question of external protection may be dismissed shortly since its effect is usually not nearly so serious as the necessity for internal protection; however, one or two simple expedients may be discussed and one or two other frequently suggested methods disposed of.

The electrolytic protection by zinc was experimentally tried on a small scale and it was found that the iron loss of steel test material could be reduced to 30 per cent of its former value by contact with zinc of surface 0.175 of that of the steel. For the average area of 8,000 square feet for one coil, the zinc required to effect the same reduction would have an area of 1,400 square feet. Even so, such protection would only result in a calculated longer life of one-fifth year on an unprotected life of 5.1 years.

Many substances when dissolved in the water are known to have an inhibiting effect on corrosion, while some conditions definitely accelerate corrosion. A steel strip half submerged showed double the corrosion rate of one completely immersed; the presence of oil as an emulsion or surface layer reduced corrosion by 80 per cent; a 0.1 per cent solution of potassium dichromate reduced corrosion by 70 per cent; sodium silicate dissolved to give a pH value of approximately 11 brought about a reduction of 50 per cent. In all cases a salt water containing 5.05 grams total solids was used for test solutions.

It will be readily appreciated that unless the water were recirculated, the use of potassium dichromate and sodium silicate would prove expensive and where recirculated, there is usually enough oil present to give good protection. Idle coils might be protected by well-filled boxes, a surface layer of oil being added to prevent solution of oxygen from the air; the location with regard to fire hazard will determine how far this can be carried out, but a high flash oil in a thin layer is probably the cheapest means of such protection. In the construction or reconstruction of condensing equipment, reasonable submergence of the coils will play a large part in reducing the corrosion of the upper rows of the coil, which usually suffer the greater part of the external corrosion.

Protection—Internal

Internal protection of condensers consists almost entirely of rendering harmless the corrosive substances released during distillation and present with the vapor and condensate in the condenser. In crude distillation, hydrochloric acid is usually the most active product, while hydrogen sulphide is frequently the most plentiful of the corrosive agents. In rerunning acid treated stocks, sulphur dioxide becomes a factor in corrosion.

Use of Ammonia

Of the common alkalis suitable for neutralizing such acid conditions, lime, soda ash, caustic soda and ammonia readily come to mind. Of these, ammonia is the most readily applicable since it can be purchased as a liquid and delivered to the unit as a gas. The solid chemicals require labor for handling and dissolution to render them suitable for application. The cheapest, lime, has the disadvantage of being only slightly soluble in water. Comparison of prices shows that ammonia in bulk compares favorably with caustic soda when calculated on the equivalent neutralization basis. This comparison can be made by simple calculation using as the basis the prices in any of the published lists, but consideration will of course be given after that to special delivery rates with reference to total quantities of the various chemicals used.

The efficacy of ammonia is well illustrated in Table 6 where iron losses from a condenser were reduced by approximately 80 per cent.

Much higher losses were frequently encountered in the running of West Texas crude and the amount of ammonia used was based on an examination under more severe conditions, but there seems no reason why the higher losses should not be reduced to the same low figures. The ammonia was introduced into the vapor line immediately ahead of the condenser, a small stream of water also being introduced at a neighboring point when the natural water was low, in order to insure washing out any ammonium salts formed.

On the basis of a requirement of approximately 3 pounds of ammonia per 1,000 bbls. of crude delivered to the naphtha condensers in service on sour crudes, the layout of the refinery for ease of application of ammonia from a central storage, the possible use of discarded pressure equipment strong enough to withstand approximately 200 pounds per square inch pressure for storage, the cost of replacement of condensers, rundown lines, pumps and tank bottoms—on these items the installation of a central distributing system, whereby ammonia could be contracted for in tank car lots, merits very serious consideration.

Use of Caustic Soda

The application of caustic soda to the neutralization of charge stocks is not without some hazard, owing to the possibility of embrittlement of stills under the action of heat. Where corrosion of condensing equipment only is considered, such a hazard does not occur, since the solution can be sprayed into the vapor line. A 10 per cent solution could be pumped in a fine spray into the vapor ahead of the condenser and recirculated from a separator or rundown tank until exhausted. An alternative method would be to use a very weak solution and discard it after passing through the coil once.

Corrosion Resistance of Metals

A few ferrous alloys tested in the stream from distillation of acid treated naphtha showed that metals of the 18-8 (chromium-nickel) type show good resistance and that cast iron is more resistant than steel, while small additions of copper to cast iron appear to lessen its resistance; low chrome steel shows only low resistance to this type of corrosion. An alloy cast iron of the following composition: Nickel, 12-15 per cent; chromium, 3-4 per cent; copper, 5-7 per cent; silicon, 1.5 per cent; total carbon, 3 per cent, and the remainder iron, has proved very resistant in such a service. Cast iron, on account of its low cost and moderately long service, is reasonably economical, but a trial of the above alloy may justify the higher capital expenditure.

After consideration of the various means for obtaining longer life from condensing equipment, it appears that ammonia will prove the most satisfactory chemical for this purpose and its use in conjunction with cast iron will in all probability be preferred over that of corrosion resistant alloys involving high capital expenditure.

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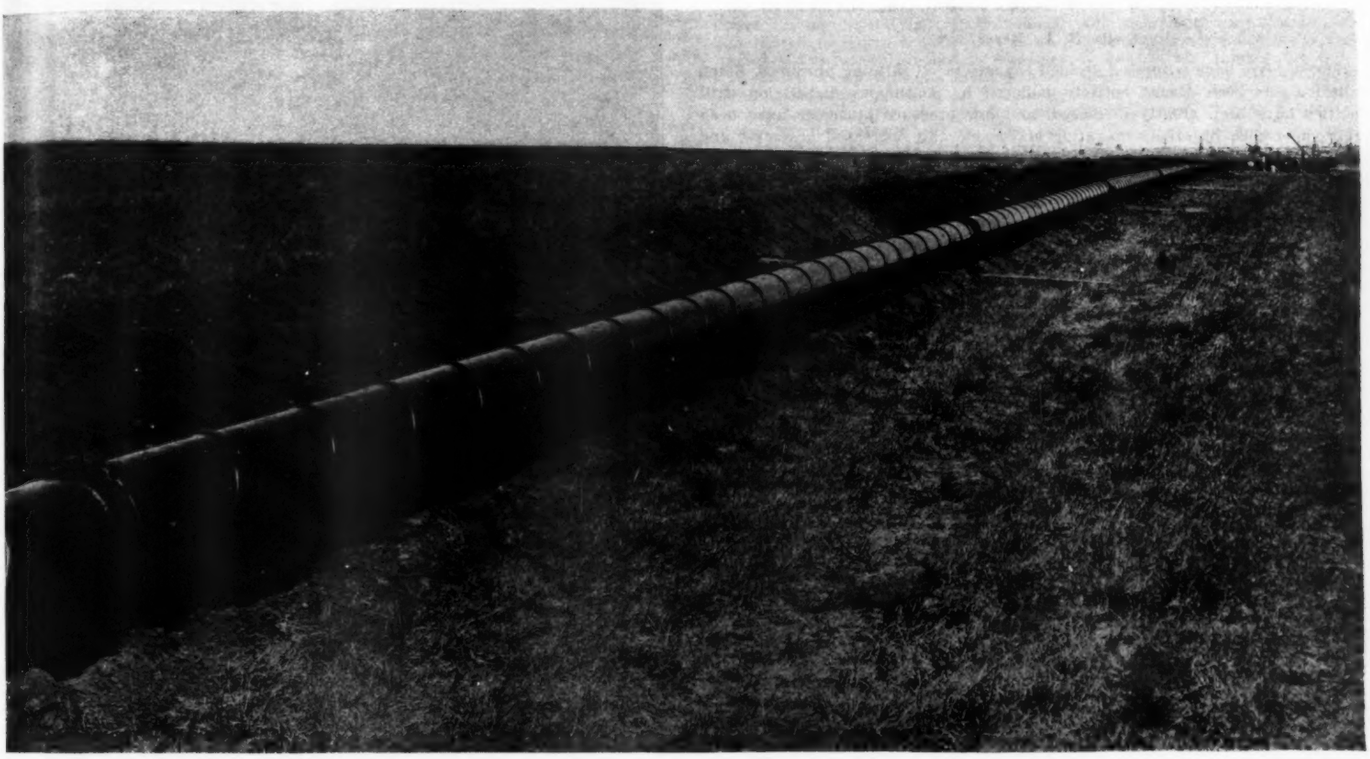

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Power Generated at Low Cost by Use of High Pressure Steam

* * * * * *

By R. L. Meyer*

Recent years have witnessed decided changes in oil refining processes. Batch distillation has been almost entirely replaced by continuous distillation, still capacities have been greatly increased, and low pressure processes have been largely superseded by others operating at considerably increased pressures and temperatures. These improvements have resulted in marked changes in the steam-electrical cycle in oil refineries.

In the older low pressure processes the amount of steam required for pumping and electrical power constituted a comparatively small proportion of the amount of low pressure steam required for heating and process. Under these conditions it was possible to generate sufficient power in inefficient direct-acting pumps, or turbines having high water rates, with steam at pressures between 80 and 100 pounds ga. at the throttle and with 10 to 15 pounds ga. back pressure, without producing quantities of exhaust steam which could not be used economically. With increases in pressures and capacities of units the amount of power required for pumping and other purposes increased to such an extent that the balance between the amount of steam for power and process was disturbed. It became necessary to devise other methods of producing power if economical operation was to be maintained.

Where large quantities of steam are required for process or heating, it is extremely economical to generate the electricity required for power as a by-product by producing steam at a pressure higher than that required for process work and reducing this steam to the plant pressure in turbines. The initial steam pressure in such cases depends upon the relation between the minimum steam production and the maximum electrical demand, particularly in an industry where these two conditions may occur at the same time. The case in which the steam and electrical load curves are practically parallel simplifies the problem and approaches the ideal condition.

Tendencies in refining have been toward a reduction in the amount of steam, and an increase in the amount of electrical power used per unit of product. In applying a power cycle involving the generation of power as a by-product to the requirements of a large and growing refinery two conditions should be satisfied. The cycle should be sufficiently flexible to meet the variations in seasonal demand as reflected in the pumping and heating loads, and it should also anticipate any future reduction in the steam usage, or increase in the electrical demand. Where the steam production is considerably in excess of the quantity required for electrical power, it seems most logical to generate steam initially at two pressures with the boilers and piping designed so that they may be converted to the higher pressure as it becomes necessary to install additional generators to take care of the increases in the electrical demand. Should the cycle originally selected fail to anticipate future load conditions correctly, so that it becomes impossible to generate sufficient electrical power without producing excess exhaust steam, there are two solutions open. Either a cycle with still higher initial pressure may be superimposed on the existing system, or additional power may be generated in condensing units. The generation of electricity as a by-product is decidedly more economical than the use of the condensing cycle. The savings, however, due to the use of such a cycle may not always justify the expenditure involved.

Changes in refining methods and increased production caused the Whiting refinery of the Standard Oil Co. (Indiana) to be confronted with this problem of economical production of steam and electrical power and resulted in the construction of the Stanolind Power Station. This station produces steam for electrical power as well as for refinery processes and pumping and in it have been incorporated the latest advances in power station design.

*Standard Oil Co. (Indiana).

* * * *

Design of Plant

The actual design of the plant and selection of equipment was preceded by a careful and exhaustive survey of the immediate and future requirements for steam and electrical power. The data collected not only supplied the information required for complete load curves and heat balances but also served as a basis for determining the most logical location of the plant in the refinery with relation to trackage facilities and connection to existing steam and electrical distribution systems. After determining the limiting steam and electrical demands upon the new plant, the balance between these demands was arrived at by setting the initial boiler pressure at such a point that the greater amount of the power required would be produced by reducing the steam in turbo-generators from the initial boiler pressure to the existing plant steam pressure of approximately 125 pounds ga.

The immediate demand for power was such that not all the steam could be put through the turbines; therefore, only one-half of the boiler plant is being operated at the maximum pressure of 400 pounds ga. The remaining boilers produce steam at the plant pressure and the steam passes directly into the distribution mains. The variations in the demand for power and steam are taken care of by means of a desuperheater in which the high pressure steam is reduced to the lower pressure and temperature at which it can be distributed to the refinery. Additional power is produced by passing steam through three low pressure turbines, reducing its pressure from 125 pounds ga. to 10 pounds ga. This steam is used for heating the feed water to the boilers and supplying the deficiency of exhaust steam in the plant. As the demand for electrical power increases with future extensions to the refinery it is the intention to convert additional boilers to high pressure operation thus maintaining an economical balance between steam and power requirements. With this brief outline of the steam power cycle let us consider some of the station in general.

The plant is housed in a steel and reinforced concrete building which provides space for the boiler, generator, and electrical equipment, and also for the offices of the superintendent of the steam department and his clerical force, a laboratory for testing purposes and a storeroom for tools, spare equipment and supplies.

A part of the switch room housing the Armorclad circuit breakers of motors and refinery feeders. Note the rack operated gears for removing breakers.

* * * * * * * * *

Boiler Equipment

The boiler equipment consists of eight Babcock and Wilcox bent tube boilers designed for a maximum working pressure of 415 pounds ga. Initially, four of these boilers will operate at 125 pounds ga. The boilers are arranged in two rows of four boilers each facing a central firing aisle. Each boiler has a heating surface of 15,000 square feet and is equipped with a B.&W. superheater, a B.&W. economizer, and a Combustion Engineering Corp. plate type air heater. This equipment is identical for each boiler with the exception of the superheater surface. The furnace volume is approximately 15,000 cubic feet per boiler. The rear and side walls of the furnaces are water cooled with fin tubes which were furnished by the Combustion Engineering Corp. The front walls of the furnace are air cooled above the burners and are of the suspended type. The furnaces have completely water cooled hopper type bottoms. Each furnace is equipped with four Couch type burners capable of burning either pulverized coal, oil, or gas, as well as combinations of these fuels.

The draft equipment for each boiler consists of a forced draft fan and an induced draft fan. The latter discharges the flue gases in a breeching which serves two boilers. The breechings are located above the roof and discharge into two stacks which are supported from the building steel. Each stack is 95 feet high and 17 feet 8 inches in diameter at the top. Four induced draft fans are located above the boilers in rooms on each side of the building. In order to cover a wide range of capacities each fan is supplied with two motors. The smaller motor is used for low and normal rates of operation, while the larger cuts in automatically at high ratings on peak loads. The air inlets to the air preheaters are located in the fan rooms and by means of adjustable louvers between the fan and boiler rooms it is possible to draw the heated air from the upper part of the boiler room thus providing ventilation and utilizing the hottest air available. The forced draft fans draw air for combustion through the air preheaters and discharge it into ducts beneath the floor to the front of the boiler. From this point it is carried in steel plate ducts directly up to the burner casings. Part of the air is diverted through the hollow front wall of the furnace and thence into the pulverizers to act as a carrier for the powdered coal and also to serve as a drying medium.

Handling Coal Supply

Coal is supplied to the station in gondola cars from the refinery storage. The cars are unloaded by means of a rotary car dumper located at grade level. The coal is fed from the hoppers below the car dumper onto an inclined belt conveyor by two apron conveyors. The belt conveyor discharges into a Bradford breaker where the coal is broken into lumps of 1¼-inch size and discharged onto a second belt conveyor which carries it into the coal gallery located at the top of the building. Here it is transferred to another belt conveyor extending the length of the building and located over the middle of the firing aisle. This conveyor is equipped with a traveling tripper which makes it possible to discharge coal into any bin continuously or to travel the length of the storage bins and return automatically. The storage bin for each boiler is provided with two pockets of steel plate construction. Each pocket terminates in a rotary coal valve to which is attached a spout leading to the feeder hopper on the pulverizer mill located directly below on the main floor at the front of the boiler. Two unit mills are provided for each boiler each supplying two burners. The mills are the Raymond Brothers impact type and consist of a pulverizing chamber, a separator and a fan. All mills are motor driven. Coal is automatically fed into the pulverizing chamber along with heated air. Cold air for tempering may also be admitted at the feed point. The pulverizing elements consist of a series of discs to which hammers are attached, the coal being powdered by a combination of impact and attrition. The pulverized particles of coal are drawn up into the separator from which the fines pass out through the fan to the burners while the heavy particles are returned to the mill thus insuring uniform fineness of pulverization.

A complete system for burning fuel oil has also been installed, consisting of steam and motor driven pumps, storage tanks, heaters, and supply and circulating lines. The oil burners are of the steam atomizing type.

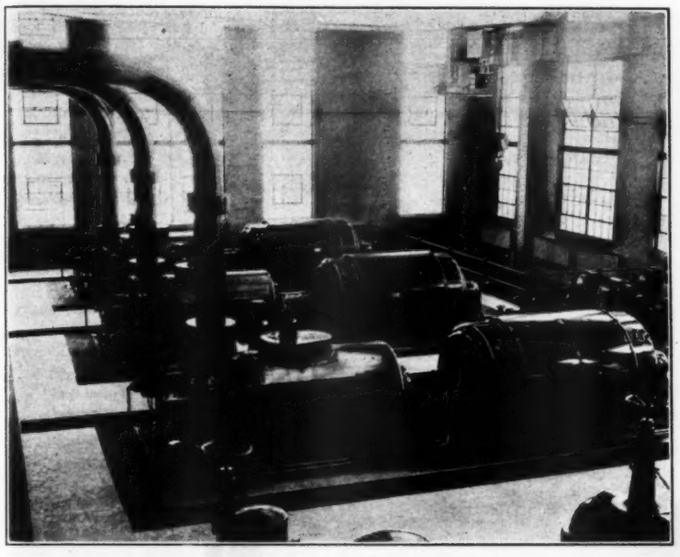
The station is also connected to the refinery fuel gas system and this fuel can be burned alone or in combination with either of the other fuels.

Disposal of Ashes

Ashes drop into the hoppers below the furnace from which they can be dumped by means of hand operated sliding gates onto plates below. From these plates the ashes are washed by jets of

water into a sluice directly below the basement floor. Water for sluicing ashes is supplied by a 1,500 g.p.m. pump. Accumulation of soot and ashes in the hoppers located beneath the air heaters and economizers can also be removed by water jets which carry the material into the main sluiceways. The basement floor of the station is actually on the ground level, the main floor or operating level being 16 feet above grade. The sluice extends the length of the building below each row of boilers. After joining, the common sluice is carried out to a sump where the water overflows in the sewer, leaving the ashes behind. The ashes are periodically removed with a locomotive crane and hauled away in cars.

Practically none of the steam leaving the power plant for distribution to the refinery is returned in the form of condensate. With the exception of the small amount of steam used in the direct contact feed water heaters all the water supplied to the boilers is makeup. This presents a problem of considerable magnitude where the operation of boilers at fairly high ratings and temperatures is contemplated since it means that nearly all of the feed water must be treated or purified in some manner. The use of evaporators for such large quantities of water as involved in this case was not considered feasible.



Turbine room in which three 5000 kw turbo-generators are located.

Boiler Feed Water

The boiler feed water for the Stanolind station is Lake Michigan water which has been previously used for cooling and condensing purposes on the stills and is therefore contaminated with some oil in addition to retaining its original hardness and a considerable portion of the suspended matter which it originally contained. The water is picked up from various sources in the vicinity of the station by pumps in outlying buildings. These pumps discharge to the raw water treating plant adjacent to the station. A connection from the refinery fire main supplies water in case of emergency. The raw water first enters a 15'x15' vertical agitator tank in which it is thoroughly mixed with alum and chlorine. The alum solution is prepared in a mixing plant located in the power station and discharged into the raw water inlet line by two motor driven simplex plunger pumps. The function of the chlorine is to kill algae growths and prevent clogging of the filters. The agitator is equipped with a variable speed reducer so that it can be operated at any speed desired between its minimum and maximum limits.

The raw water next passes through two 8'x30' horizontal drums known as rough settlers. Oil and sludge are drawn off these settlers. Further settling and skimming takes place as the water passes in series through two 50'x50' and three 35'x30' storage tanks. For pumping the settled water to the power station for further treatment three 2,000 g.p.m. pumps are provided. These pumps discharge through eight 8'x20' horizontal filters, to six 9'x20' horizontal zeolite softeners. Provisions are made for washing filters with alkali solution and with air, and for backwashing both filters and softeners. Control during backwashing operations is maintained by a V-notch weir actuating a float operated valve. The zeolite is regenerated with a salt solution at regular intervals followed by backwashing with filtered water. A salt storage bin is located in one corner of the station. The regenerating solution is prepared by introducing treated water into the storage bin and drawing off the saturated solution into a smaller tank where it is diluted to the desired concentration. The brine is supplied to the softeners by two centrifugal pumps.

After passing through the softeners the water discharges into a head box, the quantity being regulated by a float operated valve which is controlled by floats in the head box and in the main reservoir. From the head box the water flows into an acid mixing chamber which is located within a 50,000-gallon reservoir under the boiler room basement floor. A dilute solution of sulphuric acid is introduced into the mixing chamber in proportion to the flow of water in the head box. Thorough mixing of the acid and water is accomplished by agitating with air in the mixing chamber as well as in the main reservoir. Air for this purpose and for air washing of the filters is supplied by two Boston type blowers. The acid is fed to the treating system by gravity.

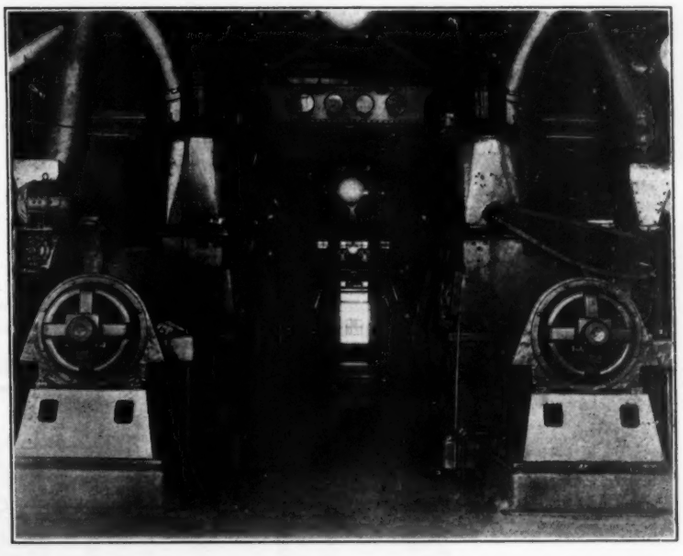
Three 1,500 g.p.m. booster pumps take suction from the treated water reservoir and discharge into a header to which a 100,000-ga. elevated storage tank is connected. This tank maintains a constant pressure in the header and provides about an hour's supply of water for emergency service. In addition to the elevated storage tank, a 60'x40' tank for treated water storage is located adjacent to the station. This tank provides an additional supply of treated water in case it is necessary to shut down the entire treating plant.

Deaerating Heaters

The feed water from the booster pumps passes through two heat exchangers in which heat is picked up from the continuous blowdown system by means of which the concentration of solids in the boilers is kept down to about 175 grains per gallon. The blowdown water from the four high pressure boilers discharges into a drum where part of it flashes into steam at a pressure approximately equal to that in the deaerating feed water heaters. The steam passes off into the steam line to the deaerating heaters and the highly concentrated water remaining in the flash drum passes through a heat exchanger in which it is cooled by the feed water passing the shell of the exchanger to a temperature approximately equal to that at which it was supplied to the station. The system for the four low pressure boilers is identical to that provided for the high pressure boilers.

After passing through these heat exchangers the feed water enters two deaerating type open feed water heaters where its temperature is increased to about 200° F. The steam for heating the feed water is supplied principally by the exhaust from the three low pressure turbines operating at 125 pounds ga. initial pressure. A deficiency of exhaust steam can be supplied by bleeding 125-pound steam into the exhaust line. This is done by means of an automatic regulator which maintains a constant pressure on the exhaust system. The exhaust lines from the turbine driven standby feed pumps and the turbine driven exciter are also connected into the exhaust system.

The two deaerating heaters operate in parallel and are connected into a common header from which the high pressure and low pressure boiler feed pumps take suction. In case the deaerating heaters are down these pumps can also take suction from the booster pump discharge header. The feed water for the high pressure boilers is supplied by three 1,100 g.p.m. pumps, of which two are motor driven with one turbine driven standby. The low pressure boilers are supplied by three similar pumps of 1,100 g.p.m. capacity each. Duplicate feed headers are provided for each group of four boilers. Branches from each header join at the inlet to the economizer. Between the economizer outlet and the boiler feed inlets are located differential pressure and feed regulating valves which maintain a constant differential between the boiler and the feed header and control the rate of feed to the boiler.



Main isle of the boiler room showing the unit pulverizers. The 4 high pressure boilers are on the left and on the right are 4 low pressure boilers.

Automatic Combustion Control

Manual control of boiler room equipment has been reduced to a minimum by the installation of a system of automatic combustion control. This equipment permits the operation of the boilers either automatically or manually from individual control panels located on the operating platforms at the front of each boiler. On these panels are mounted the boiler draft gauges, steam flow-air flow meters, temperature indicator, ammeters for pulverizer and fan motors, emergency stop buttons for the fan motors and start and stop buttons for the pulverizer mill and feeder motors. Control of combustion is effected by varying the rate of feed of the fuel and by varying the speed of the forced and induced draft fans in relation to the steam demand as indicated by the steam flow meter. A master control is also provided so that the rating on high and low pressure boilers may be varied for each group of four simultaneously if desired. Control of oil and gas fuels is entirely manual. The boiler feed pumps are driven by variable speed motors which may be operated from control boards located in the main aisle adjacent to the pumps.

Complete metering facilities have been provided for indicating and recording the flow of high and low pressure steam, and such temperature and pressure measurements as are essential for arriving at a proper heat balance for the station. These meters and instruments are centrally located on a panel board in the turbine room.

As stated previously, the balance between steam and electrical demands is accomplished by the use of a desuperheater. As the demand for electrical power decreases and the steam demand increases the load tends to shift from the high pressure boilers to those operating at low pressure. In order to avoid overloading the latter and permit the operation of the entire plant at the best efficiency the rating on all boilers is maintained fairly uniform and the excess high pressure steam is reduced to a pressure and temperature equal to that of the steam produced in the low pressure boilers.

The steam first passes through a pressure reducing valve, the reduction in pressure being accompanied by an increase in superheat. The highly superheated low pressure steam then passes through the tubes of a heat exchanger in which it is cooled to the desired temperature by water from the boiler feed system. This water is evaporated and the steam produced in this manner also passes into the low pressure steam mains. In speaking of low pressure steam it is to be understood that the reference is to steam at the pressure existing in the refinery distribution mains.

Generating Equipment

The generating equipment consists of three 6,250 k.v.a., 0.8 power factor, 3,600 r.p.m., 2,300 volt, 3 phase, 60 cycle, Allis-Chalmers turbo-generators. The steam pressure at the throttle is 375 pounds ga. with a total temperature of about 625°, and the exhaust pressure is 125 pounds ga. The exhaust from these units joins the steam leaving the desuperheater and that produced by the low pressure boilers and is distributed through the plant steam mains to the

(Continued on Page 123)

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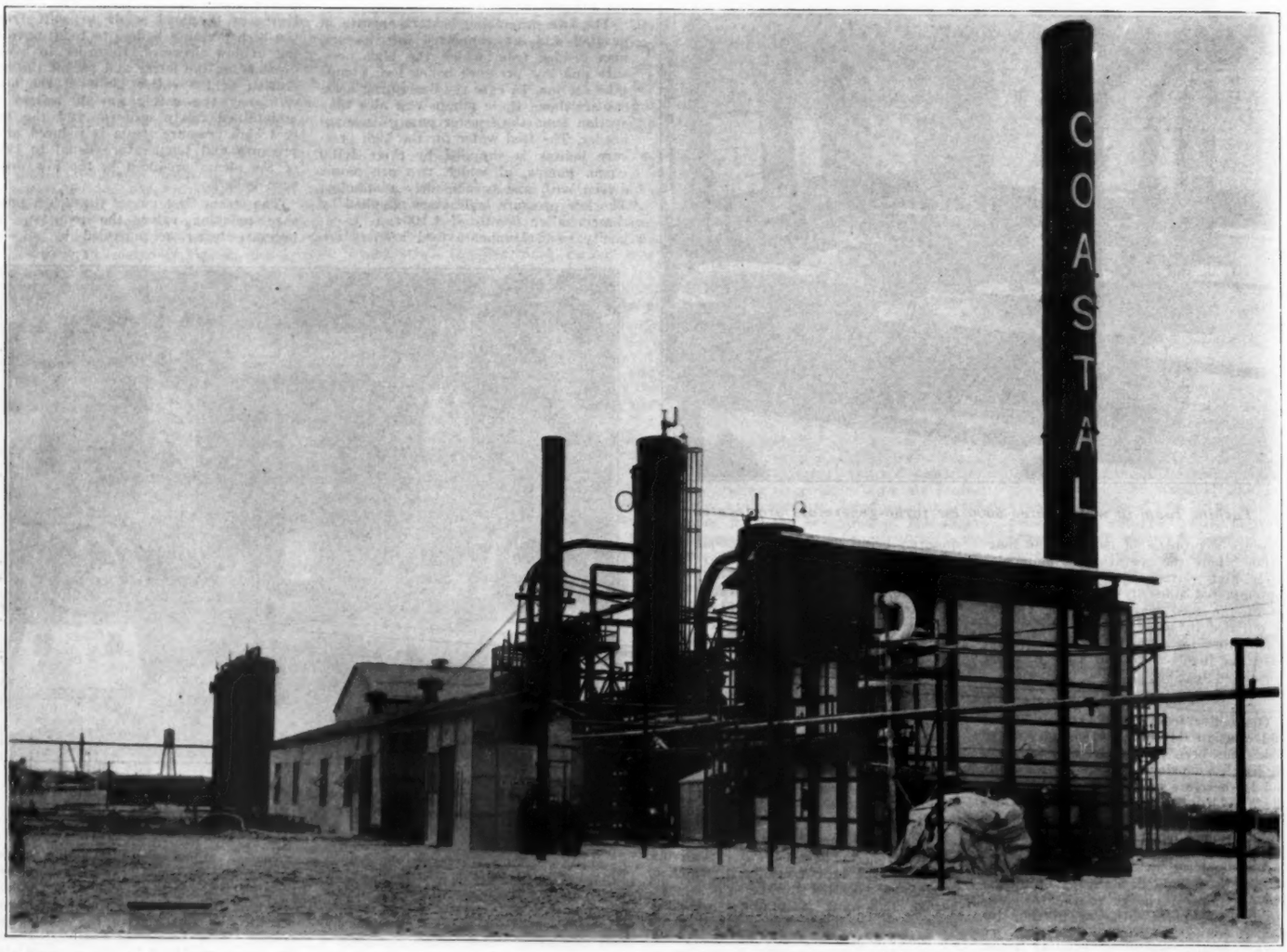

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New Laboratory Of Vacuum Oil Company Permits All Types of Research

* * * * * *

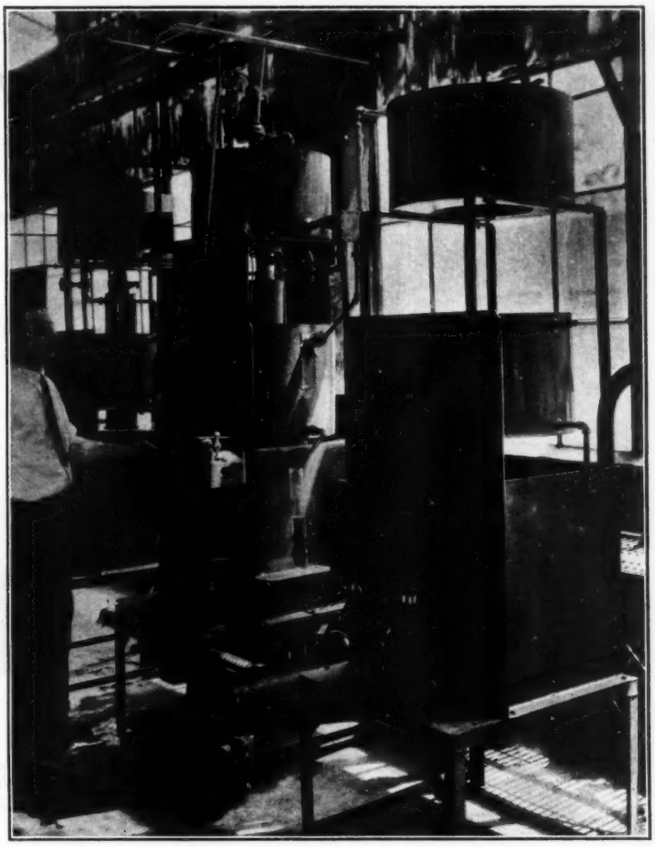
Research Department, Vacuum Oil Co., Inc.

An index to the important part that research plays in the continued progress of the Vacuum Oil Co., Inc., is the new and efficiently equipped research laboratories recently completed at Paulsboro. Here, with the most advanced and modern equipment and under excellent working conditions, more than 140 highly trained specialists—chemists, engineers and assistants are working.

The research laboratories are not new to Paulsboro. Several years ago, when it was decided to cntralize all of our work of this nature at the Paulsboro refinery, the buildings which formed the nucleus of the present research group were erected. As the research work increased more buildings were added and the group of workers was increased. With the growing integration of the company and its interest in products other than lubricants increased, the necessity for greatly increased facilities became apparent. About two years ago it was decided to reorganize our research work and to redesign and materially increase the facilities to enable the company better to meet modern conditions in its field.

The buildings are well separated to provide the maximum of light and air. They are sufficiently isolated from the refinery to remove the research workers from the distractions of manufacturing operations, yet near enough to make easily available to the research department the many facilities of the refinery.

The research area covers three acres. The four main buildings provide more than 62,000 feet of floor space. The buildings were designed by our own engineers. All of the laboratories are large with high ceilings. In every room, save those which are insulated or rooms designed for work in which natural light is a disadvantage, is an abundance of windows.



Three stills used for experimental distillations in the chemical engineering building of Vacuum Oil Co.'s research laboratories, Paulsboro, N. J.

* * * * * * * * * * * * *

In the two-story administration building of steel, concrete and brick are six offices and seven large laboratories for physical chemical work. Such accessories and aids as electricity, compressed air, vacuum, etc., are available at conveniently placed outlets. In this building, also, is a library of more than 3,000 volumes.

Next to the administration building is another building of the same size and appearance. This was the first building of the group and for some time accommodated the administration offices and some of the laboratories. Here, now are 3 offices and 10 chemical laboratories, devoted chiefly to organic and analytical work. The basement of this building accommodates tests and research operations in which natural light is disadvantageous, while in the administration building, the basement is used chiefly for storerooms.

At the rear of the organic and analytical laboratories is the chemical engineering laboratory, occupying a one-story building, 70 feet wide and 215 feet long. In this building there are a few offices but most of the space is given over to workrooms and laboratories. Here is a small-scale treating room in which many products can be manufactured in small batches for test and research work. Here, also, is a cold room and a refrigeration plant.

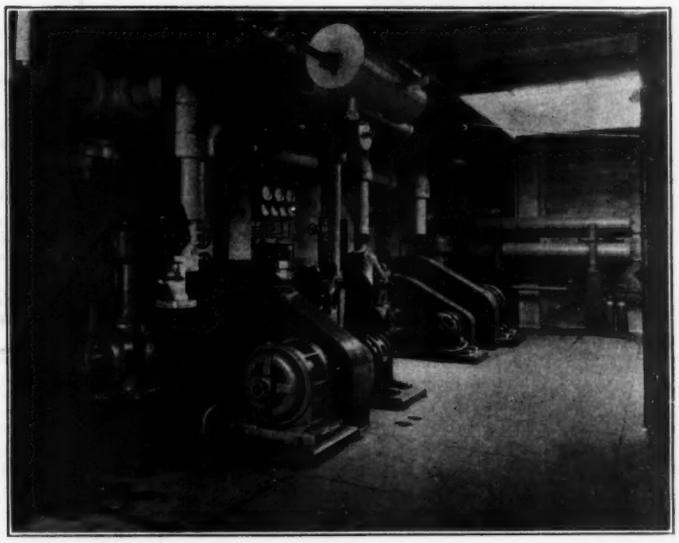
The most interesting feature of the chemical engineering laboratory, however, is a great room devoted to process development. Here ideas, worked out in the other laboratories, are operated and tested under conditions which stimulate, on a small scale, actual operating conditions.

Now three experimental stills are in operation. Other devices, if they prove their worth, may be seen in magnified form in the refinery on some later day, are operating under the watchful eyes of development engineers. In one set-up the controls are within the room but the main part of the apparatus is housed just outside the building. A sheet steel safety cover protects the workmen from any erratic performance of the apparatus while in the development process.

Paralleling the chemical engineering laboratory is the mechanical engineering laboratory, most of which is occupied by the automotive division. This is a one-story building, 74 feet wide and 215 feet long. In the front are seven offices and a well-equipped photographic room. Adjoining is the machine room in which the refrigeration machinery is housed. Here,

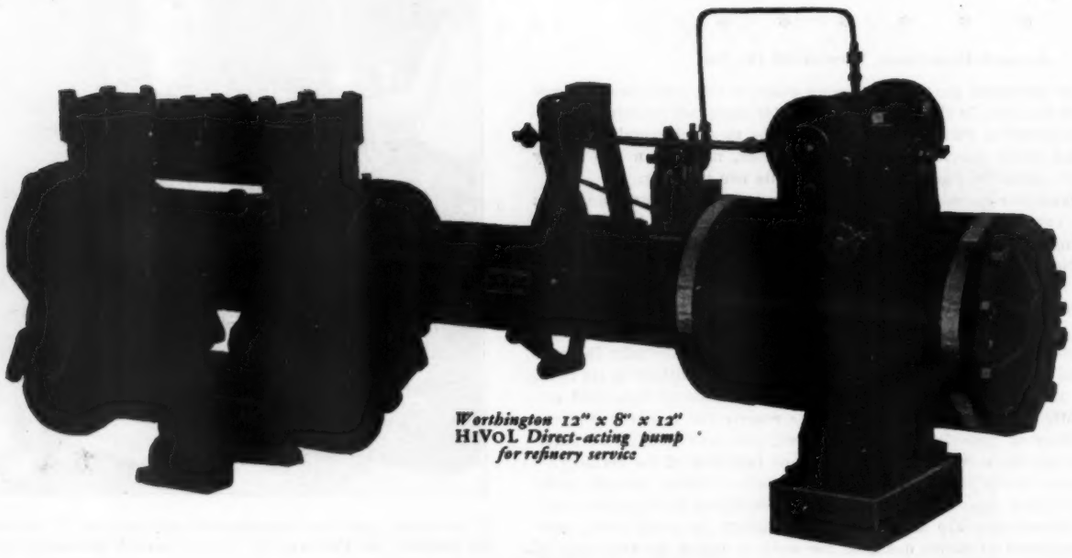
(Continued on Page 165)

A corner of the engine room showing switchboard and some of the pumps.

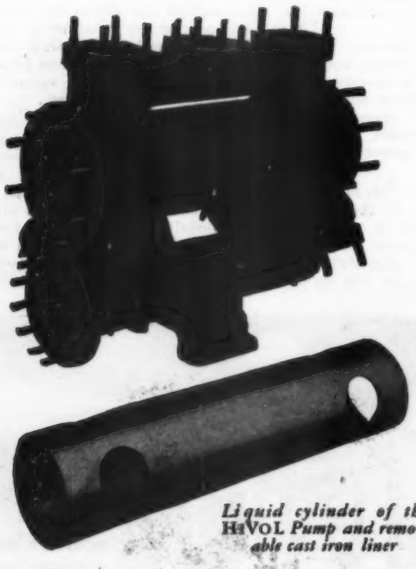


Some of the refrigerating equipment in the Vacuum Oil Co.'s research laboratories at Paulsboro, N. J.

ANNOUNCING A



Worthington 12" x 8" x 12" HIVOL Direct-acting pump for refinery service



Liquid cylinder of the HIVOL Pump and removable cast iron liner

Here's how you can test the clearance of your "close clearance" steam pumps:

First figure the entire volume of the pulsation chamber. This includes:

Volume of the bore equals area in sq. in. multiplied by length between heads in inches.

Volume of any recesses or counterbores at ends of cylinder.

Volume of chambers above suction valve seats.

Volume of ports between suction valve chambers and cylinder bore.

Volume of chambers under discharge valves, including openings in valve seats.

Volume of ports connecting cylinder bore to discharge valves.

Total of above gives gross volume of pulsation chamber.

From this gross volume deduct:

Actual volume of piston.

Volume of that part of piston rod which is within the pulsation chamber when piston is at outboard end of its nominal stroke.

Volume of suction valves, guards, stems and springs.

This gives the net volume of pulsation chamber.

Figure displacement per stroke equals (area of piston minus ½ area of rod) multiplied by length of nominal stroke.

$$\frac{100 \text{ (Net Volume minus Displacement)}}{\text{Displacement multiplied by 2}}$$

equals Percent of Clearance (Average of the two ends)

It is sometimes difficult to figure the volume of the various chambers and ports. The clearance can readily be checked by filling the cylinder with liquid. Make sure that the suction valves do not leak and allow liquid to run out. Remove discharge valve hole covers and discharge valves from each end of cylinder. Pour a measured amount of liquid into the cylinder, filling both ends to the level of the faces on discharge valve seats. This gives the net volume of pulsation chamber.

Figure displacement per stroke equals (area of piston minus ½ area of rod) multiplied by length of nominal stroke.

$$\frac{100 \text{ (Net Volume minus Displacement)}}{\text{Displacement multiplied by 2}}$$

equals Percent of Clearance (Average of the two ends)

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This pump is such a distinct advance in refinery equipment that we believe every engineer interested in pumping problems will want the details.

Bulletin D-111-S4, just printed, contains illustrations and a complete description of the HIVOL Pump. Write for a copy or use the coupon below. Meanwhile we suggest that you test your present pumps according to the simple but accurate method explained on the opposite page . . . to prove to yourself that the clearances are not in the neighborhood of 15%.

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1. Improved design differs from any other on the market.
2. Incorporates gas compressor type of design to insure minimum clearance.
3. Straight line flow insures minimum turbulence.
4. The location of the valves results in a liquid end of least possible clearance, mathematically figured and checked by actual volumetric tests.
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NGTON

Increasing Significance Of Olefins In Petroleum Chemistry

* * * * * *

By A. R. Bowen, Ph. D.
University of Birmingham, England*

THE present trend in refining is apparently toward the increased production of olefin hydrocarbons. As the result of carrying on cracking operations under more severe conditions of temperature and pressure to gain a motor fuel which has a relatively high octane number there is an accompanying high yield of olefin hydrocarbons. The utilization of these olefins is discussed by Doctor Bowen here, including their importance in the manufacture of many important commodities outside the oil industry. Doctor Bowen also discusses the possibilities of converting those hydrocarbons commonly occurring in petroleum and natural gas into olefins suitable for further processing, should the need arise. The utilization of olefins in the manufacture of various alcohols is cited as an example. Along with the alcohols, it is not dificult to make their corresponding ketones and ethers. A typical practical application of the chemistry of such conversions is given in the preparation of ethylene glycol now used so extensively in explosives and as an antifreeze in automobiles. In turn, ethylene glycol serves as the base for the manufacture of many solvents, especially for lacquers. Included in the list of derivatives which Doctor Bowen discusses are "Cellosolve," a solvent for cellulos nitrate, ethylene glycol monoethyl, ethyl, "Carbitol," triethanolamine, etc.

In discussing the relationship between the antiknock properties of olefins as a class, Doctor Bowen points out that each olefin exerts a different influence as a knock suppressor and this in turn is dependent upon its chemical composition or structure.

In considering the numerous research activities of the petroleum industry it is significant that many of these researches are concerned with the properties and characteristics of olefin hydrocarbons. The production of olefins, their conversion to alcohols and other chemical raw materials, their function in motor fuels and their polymerization to possible synthetic lubricating oils, are the fields of research concerned.

Cracking gases, especially those from vapor-phase units, constitute the richest source of olefins. A typical analysis of vapor-phase cracking gas[1] (Gyro) is:

$CO_2 + H_2S$, per cent	0.25
CO, per cent	0.15
H_2, per cent	7.00
Ethylene, per cent	27.00
Propylene, per cent	16.00
Butylenes, per cent	9.00
Butadiene, per cent	1.00
Paraffins, per cent	39.60

Smaller proportions of olefins are produced in liquid phase cracking processes. Typical analyses of liquid phase cracking gases[2] are:

	1	2	3	4
Hydrogen, per cent	1.9	5.6	3.0	1.7
Ethylene, per cent	1.9	4.7	2.7	6.3
Propylene, per cent	0.8	6.1	7.6	12.0
Butylenes, per cent	7.4	2.0	6.5	7.1
Paraffins, per cent	88.0	81.6	80.2	72.9

Further analyses are given by Wagner[3]:

	Cross process	Gyro process
Methane and hydrogen	46.3	35.4
Ethylene	1.23	22.9
Ethane	16.6	13.3
Propylene	5.3	18.1
Propane	16.2	0.0
Butenes and butadiene	4.3	5.5
Butanes	6.1	1.4
Pentanes and heavier	3.7	3.4

Natural gas produced with petroleum contains no olefins, being almost entirely paraffinic; however, olefins can be obtained from the hydrocarbons higher than methane by dehydrogenation, by partial oxidation, and as by-products in the hydrolysis of certain alkyl chlorides produced by direct chlorination of paraffin hydrocarbons.

Dehydrogenation of Hydrocarbons

The dehydrogenation of paraffin hydrocarbons is, at present, of theoretical interest only, though may become of importance if large supplies of olefins are needed. According to the free energy calculations of Francis[4] the direct removal of hydrogen from a paraffin to form an olefin with the same number of carbon atoms is possible only at high temperatures and to a limited extent.

It has been reported that a process for the conversion of ethane to ethylene has been carried out commercially[5].

Some experimental figures upon the dehydrogenation of ethane to ethylene are shown in the cracking experiments (static) of Williams-Gardner[6].

GASEOUS PRODUCTS FROM ETHANE HEATED AT 700° C.

Duration of heating, minutes	1	15	30	60
Hydrogen, %	6.83	8.13	20.83	26.3
Acetylene, %	0.49	0.96	0.62	0.29
Higher olefins, %	0.93	2.04	2.19	2.21
Methane, %	7.59	35.69	48.89	59.2
Ethylene, %	5.21	13.42	10.26	3.94
Unchanged ethane, %	78.86	29.99	18.59	8.8

Pease and Durgan[7] have studied the reversible reaction: $C_2H_6 \rightleftarrows C_2H_4 + H_2$ and measured the equilibrium data at 600°, 650° and 700° C. The equilibrium was approached from both sides, and, apart from some uncertainty due to the simultaneous formation of methane, there were indications that the equilibrium constants at the three temperatures were 0.031, 0.082 and 0.20, respectively, partial pressures being expressed in atmospheres.

Similar dehydrogenation reactions take place on heating propane and the butanes, but as the series is ascended there is an increased tendency for a paraffin to be split off to give a lower olefin thus:

Propane $\longrightarrow$ ethylene + methane
Propane $\longrightarrow$ propylene + hydrogen

Several patents are held upon this subject[8]. The separation of olefins and paraffins of close boiling points has been the subject of a certain amount of work; for example[9] it is claimed that a ready separation of such hydrocarbons as butane and butylene is effected by fractional distillation under suitable pressure in the presence of liquid anhydrous ammonia or methylamine. Other methods of separation depend on the solubility of gaseous olefins in ammoniacal solutions of cuprous and other salts. The analysis of these cracking gases for control work is readily accomplished in the Podbielniak apparatus.

Other Production Methods

Perhaps the most promising method of producing olefins from paraffin hydrocarbons is by partial oxidation of butane with air at relatively high temperatures. Amylenes are formed as by-products with the amyl alcohols in the hydrolysis of chlorinated pentanes[10].

Conversion to Alcohols

The olefin mixtures can be separated by pressure and by treatment with different strengths of sulphuric acid[11]. Generally the olefins may be converted into alcohols by the following methods: Direct hydration either in the liquid or gaseous phase under the influence of catalysts, esterification of olefins by means of sulphuric or sulphonic acids followed by the hydrolysis of the ester formed, esterification of the olefin by means of hydrogen halides or organic acids followed by hydrolysis. So far, only the sulphuric acid absorption method is generally applied.

At the moment, a large amount of ethyl alcohol is not made from petroleum gases, but a great potential supply of ethylene exists for utilization in this way when economically possible.

There are many points of interest in these alcohol syntheses. The apparently simple problem of the conversion of ethylene to alcohol, by absorption in sulphuric acid and hydrolysis of ethyl sulphuric acid or diethyl sulphate, is a reaction which needs very careful control. Under certain conditions hydrocarbons can be formed by the polymerization of ethylene. Too strong an acid can convert ethylene to carbyl sulphate, which will not hydrolyze to ethyl alcohol. Many investigators have studied the effect of varying the conditions of the absorption of ethylene in sulphuric acid, without catalysts. Damiens[12] has examined the factors involved in the absorption of ethylene, such as: Composition of the acid, efficient gas-acid contact, partial pressure of ethylene, temperature of absorption, and the presence of catalysts in the acid. Sulphuric acid of 99.5 per cent strength was found to give an absorption velocity of three to five times that of a 95.5 per cent acid. Cuprous compounds were found to be good catalysts. Other investigators have found silver sulphate to be a good catalyst, and a recent patent[13] recommends the use of ferri- and ferrocyanides as catalysts which are claimed to suppress oily product formation. However, most catalysts suffer from the objection that they become inactivated eventually by tarry deposits, and should be avoided if possible.

The alcohols produced from cracking gases are isopropyl alcohol, secondary and tertiary butyl alcohols, and secondary amyl alcohol, of which isopropyl alcohol is the most important; secondary hexyl, heptyl, and octyl alcohols could also readily be prepared.

Ethyl alcohol[14] and secondary alcohols from isopropyl to secondary hexyl are thus prepared by absorption of the olefin with sulphuric acid, the alcohols being recovered by hydrolysis of the alkyl sulphuric ester and subsequent rectification.

Other Chemical Products

Ethyl and isopropyl ethers are formed in conjunction with the manufacture of the alcohols. Ethers of ethylene glycol are prepared by treating an alcohol with ethylene oxide. Ketones such as acetone and methyl ethyl ketone are made by dehydrogenating the secondary alcohol. Partial oxidation in presence of catalysts is a promising method for converting secondary alcohols to ketones. The esters of the alcohols previously discussed are obtained by the reaction of a fatty acid and an alcohol in liquid or vapor phase with suitable catalysts, or by treatment of the alkyl sulphuric ester with the calcium salt of a fatty acid[15].

The chief chemical raw material obtained from ethylene is the chlorohydrin from which ethylene oxide and ethylene glycol can readily be prepared. The use of ethylene glycol in explosives and antifreeze agents is well known.

Many solvents, especially for lacquers, are now prepared from ethylene glycol, of which the following are examples. Ethylene glycol monoethyl ether, "Cellosolve," is a good solvent for cellulose nitrate but not for cellulose acetate. It has but little odor, is miscible with water and dissolves ester gums, glyceryl phthalate, resin, etc. Ethylene glycol monoethyl ether monacetate is a useful derivative. Ethylene glycol monomethyl ether is a solvent for cellulose acetate and nitrate, shellac, kauri and colophony. Diethylene glycol monoethyl ether, "Carbitol," is a solvent for shellac, cellulose nitrate and colophony, and is used in textile soaps and in the dye industry. Dioxane (diethylene dioxide) is also a solvent for ester gums, glyceryl phthalate, vinyl resins, shellac, and cellulose acetate. Triethanolamine is a viscous hygroscopic liquid boiling at 277° C. under 150 mm. pressure. It is soluble in most organic liquids containing combined oxygen, but is only slightly soluble in hydrocarbons. It is mildly alkaline and its dissociation constant is 2.5×10^{-6}. Its fatty acid soaps, such as the oleate, are valuable emulsifying agents. These viscous soaps are soluble in practically all organic liquids including hydrocarbons. These soaps are valuable for the following purposes: Emulsifying mineral oils for textile lubricants, machine cutting oils, wax emulsions, cosmetic creams, emulsions of solvents for polishes, disinfectants, kerosene emulsions for sprays, and dry cleaning detergents. The use of ethanolamine bases for the continuous removal of carbon dioxide and hydrogen sulphide from gases has recently been indicated[16].

Pyrolysis of Olefins

The pyrolysis of olefins to aromatic hydrocarbons has been recently reviewed by Dunstan, Hague and Wheeler[17]. The olefins are more readily converted to aromatic hydrocarbons, including benzine, by heat treatment, than the paraffin hydrocarbons. The following figures show the conversion products:

PYROLYSIS OF THE OLEFINS FOR THE PRODUCTION OF AROMATIC HYDROCARBONS AT ATMOSPHERIC PRESSURE
(Dunstan, Hague and Wheeler)

Gas—	Temp.	Conversion into liquid %	Conversion into light spirit %
Ethylene	800° C.	34.1	17.7
Propylene	750° C.	35.6	20.4
	800° C.	40.6	19.0
Δ^1 — butylene	700° C.	35.8	23.6
	750° C.	39.6	22.45
Δ^2 — butylene	700° C.	37.0	25.8
	750° C.	39.6	23.2

The effect of pressure on this reaction was also studied by these investigators.

The cracked petrols containing appreciable quantities of olefins have consid-

(Continued on Page 166)

*Senior lecturer, department of oil engineering and refining.
[1]Wagner, The Oil and Gas Journal, April 25, 1929.
[2]Egloff, "The Cracking Process," World Power Conference, London, 1928.
[3]Refiner, June, 1930, Page 74.
[4]Ind. Eng. Chem., 1928, 20, 277.
[5]Elworthy, Industrial Chemist, 1928, 4, 275.
[6]Fuel in Science and Practice, 1925, 4, 438.
[7]J. Am. C. S., 1928, 50, 1,779, 2,715.
[8]e.g. U.S.P. 1,524,355.
[9]B.P. 348,817.
[10]Ayres, Ind. Eng. Chem., 1929, 21, 899.
[11]B. P.s. 248,375 and 249,834.
[12]Bull. Soc. Chim., 1923, (4), 33, 71.
[13]B.P. 322,748.
[14]Park, J.S.C.I., 1931, 50, 620.
[15]Ellis and Cohen, U.S.P. 1,365,050.
[16]Bottoms, Ind. Eng. Chem., 1931, 23, 501.
[17]J.S.C.I., 1931, 50, 213 T.

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PIPING MATERIALS TO CONVEY AND CONTROL STEAM, LIQUIDS, OILS, GAS, CHEMICALS

Hydrogenation Process Solves Problem of Airplane Motor Fuel

* * * * * *

By Frank A. Howard
Vice President, Standard Oil Development Co.

View of hydrogenation plant of the Standard Oil Co. of New Jersey at Bayway, N. J.

* * * * * * * * * * * *

A fireproof fuel is a self-evident absurdity. It is possible for fuel to be fire-safe without being fireproof, however. A fire-safe fuel is one which burns only when and where it is supposed to burn, that is in an engine or a burner, and which will not explode or catch fire by accident under any ordinary conditions.

A fuel must necessarily be capable of burning when raised to the kindling temperature. That is the definition of the word fuel. But if only that part of fuel which is artificially heated to the kindling temperature under the conditions of the test will burn, the adjacent portions being not sufficiently heated by this small initial combustion to spread the flame, there is, in fact, no observable flame. This is just what happens when a fire-safe liquid fuel is accidentally exposed to a spark or small flame, or even to a large flame for a short time.

* * * * * *

Suppose a body of such fuel to be held in a tank either with a vent opening, or completely closed. If the fuel be sufficiently firesafe a spark or an open flame can be introduced into the clearance space above the liquid and nothing happens. There are always a few molecules of the fuel present in the air in this space, but their number is so small and they are so widely diffused that the combustion of such of these as are actually touched by the kindling spark or flame does not create enough heat to raise the adjacent floating molecules to the kindling temperature. The flame or spark may even be brought down into contact with the liquid itself and the result is the same if the exposure is not continued for a long time. Briefly, there is too much cooling and not enough heating. The flame dies, paradoxically, before it begins. Such a fuel will act like water to actually extinguish a small blaze if it is poured onto it, or if a blazing brand is submerged in a bucket of the fuel.

To make such a liquid fuel propagate a flame it is necessary not only to supply air and a kindling flame, but by some means to cause it to give off vapors in concentrations high enough so that the ignition of each molecule will kindle the adjacent molecules, or in the alternative, to atomize the fuel into droplets so fine that each droplet behaves substantially the same as a single molecule with respect to the combustion phenomena described. Although such atomization occasionally occurs by accident in the case of solids (coal dust explosions), it almost never occurs with liquids. Aside from forcible atomization the one practical method of creating the conditions necessary for combustion or explosion of a fire-safe liquid fuel is to raise the temperature of the liquid to the point at which the vapor concentration comes within the limits of flame propagation.

Laboratory Test

The laboratory test method and technique for this determination is very simple. A quantity of the liquid is held in a cup which may be either open or closed. The cup is heated from beneath and as the temperature of the liquid rises, an open flame is periodically passed over the surface of the liquid. At a certain minimum temperature, depending upon the characteristics of the liquid fuel, the vapor concentration rises to the required point and on the introduction of the open flame there is a puff or flash indicating that the fuel has now caused the flame to propagate across its surface as well as to consume all of the molecules floating around in the air above the surface. The temperature at which this occurs is called the flashpoint of the fuel, and the test is known as the flash test.

More than 50 years of experience in the use of kerosene in almost every known form of device for storing, handling and consuming liquid fuels has shown that if the flash test be above 105° F. or thereabouts the danger from accidental ignition of spillage or leakage and from the formation of explosive mixtures with air in tankage or working quarters is negligible. More recent but quite extensive experience with special naphthas for dry cleaning and solvent purposes offers additional proof so adequate that building regulations, fire insurance and transportation laws and regulations throughout the world now recognize this approximate flash temperature as the dividing line between hazardous and safe liquid fuels for handling at normal indoor and outdoor temperatures. A safety fuel or fire-safe fuel may therefore be defined on the basis of experience and universal acceptance as one which being otherwise of the general character of normal petroleum hydrocarbons, has a flash temperature above 105° F.

With the introduction of the automobile the bad name which gasoline had borne for a generation before as a hazardous fuel to be handled only with extreme precautions against fire and explosion, was one of the first obstacles to popular acceptance of the innovation. Despite this handicap the gasoline engine soon outdistanced its competitors in the transportation field. Although gasoline is and must always be a hazardous fuel, the conditions under which it is used in automobiles reduce the hazard to a statistical figure so low that there is no great demand for improvement.

In the meantime two other fields of transportation, that is, the air and the marine field, have seen an enormous advance based almost entirely on the advance made in gasoline engine design in the automobile field. It is regrettable that experience here has not been so favorable as in the case of the automobile. The fire and explosion hazard, originally deemed to be inseparable from the use of gasoline, has been found to remain a statistically important hazard in air and marine transportation. Without being in either case weighty enough to arrest development, it is of sufficient importance to justify the most serious study.

Limitations of Diesel

There are two roads of attack, first, the use of a prime mover of a type different from the automobile engine; second, the use of a fire-safe fuel capable of satisfactory performance in the automobile type engine. The first road led through the so-called oil engine or semi-Diesel up to the full Diesel. Real progress has been made, and quite promising lightweight, high-speed Diesel engine designs have been developed and tested with some degree of success. It is well, however, to keep in mind that there are certain fallacies of reasoning incorporated in much of the propaganda for such engines. Among the more important fallacies are:

1. The assumption that if a Diesel engine can develop satisfactory performance with fuel to weight ratio approximately as good as present automobile type engines it will be a real competitor.

The implied foundation for this assumption is that the automobile type engine is going to stand still and wait to be overtaken by the Diesel. It will do nothing of the kind. The odds are very much in favor of the automobile type of engine improving faster than the Diesel because the difficulties appear to be smaller and the funds available for the work are many times greater. Radical improvement of automobile type engines was arrested by lack of competition in design, standardization requirements of mass production and too much prosperity, but is now under way again on a real scale. Three hundred pounds per square inch equivalent B.M.E.P. is already demonstrated. Engine weight per horsepower should be cut nearly in half within two years.

2. The second fallacy is the assumption that fuel suitable for high-speed, lightweight Diesel engines would be much cheaper than gasoline.

Present differences in per gallon prices of gasoline and Diesel fuel are not a direct reflection of intrinsic differences in cost or value but are based primarily upon differences in distribution costs coupled with a price structure of crude oils graduated on gasoline content. Between 10 and 25 per cent of the consumer's cost would be a fair guess on the ultimate range of difference in the per gallon price of the two fuels.

Requirements in Gasoline

While it is entirely possible that there will be an eventual solution of the fuel hazard problem through the road of the high-speed, lightweight Diesel engine, the solution is therefore neither so imminent nor so advantageous as to justify disregard of the alternative road of the production of a fire-safe fuel suitable for use in the automobile type engine. The requisites of such a fuel are sufficient volatility to permit of complete vaporization prior to ignition at charge temperature not substantially different from those used with gasoline, and octane number equal to the best antiknock gasoline.

The first requirement is met without difficulty by close fractionation, the lower limit of boiling point being, of course, fixed by the flash requirement and the upper limit by the volatility requirement. With improvement of atomization, hot spotting or distribution technique the upper limit is undoubtedly capable of being raised, but even with present developments it is sufficiently high not to present any grave practical problems.

The octane number limitation defied practical solution until the development of the hydrogenation refining process. The octane value of both natural and cracked products of the boiling point range required and as heretofore produced proved on test to be far below the practical limits for a competitive engine of the combustion-at-constant-volume cycle. Even the use of ethyl fluid in permissible quantities was not sufficient to overcome the detonation tendency of the high-flash fuels heretofore tested. It was found quite early in the study of the products from hydrogenation, however, that the octane numbers of the various fractions instead of lowering progressively with increase of boiling points could by proper choice of charging stock and operating technique be held constant or even raised in the fractions corresponding to the heavier ends of motor gasolines. This characteristic peculiarity supplied the missing link in the solution of the safety fuel problem. A complete inspection of a hydrogenated safety fuel is given below:

Inspection Data on Hydrogenated Safety Fuel

A.P.I. gravity	29.1°
Initial boiling point	312°F.
Per cent at 356° F.	50.0
Per cent at 374° F.	80.0
90% at	380°F.
Final boiling point	402°F.
Recovery	99.0%
Octane number*	95
Color	25+
Sulphur	0.009
Diss. gum (copper dish)	2.0 mgs
Flashpoint (Abel method)	106°F.

*Determined against iso-octane and heptane blends on Series 30 engine, 300° F. jacket temperature, 600 r.p.m., 190-200 lbs. per sq. in. compression pressure.

The extremely high octane number of this fuel demonstrates its suitability for use at compression ratios much higher than those in common use in the most efficient high duty engines.

Provisions for Starting

The practical use of such fuels will involve in most instances special provision for easy starting. The ordinary carburetor, although in theory an atomizing device, in practice does not carry atomization to the point where the mixture is capable of air flotation. Therefore, the fuel (not being capable of evaporating with sufficient rapidity at ordinary temperatures) either fails to reach the cylinder at all, or reaches it in a straight liquid condition, when an attempt is made to start the engine by cranking. There are numerous possible solutions of the starting problem, all of which are in practical use to some extent. In the order of simplicity they are probably:

1. Use of the direct injection engine in which the fuel is atomized by an adequate mechanical device directly in the cylinder in which it is to be burned.

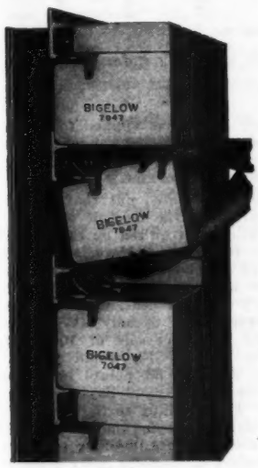
2. Use of a small quantity of gasoline or priming fluid in the regular car-

(Continued on Page 167)

Why the majority of modern oil heaters have Bigelow Unit-Suspended Walls and Arches

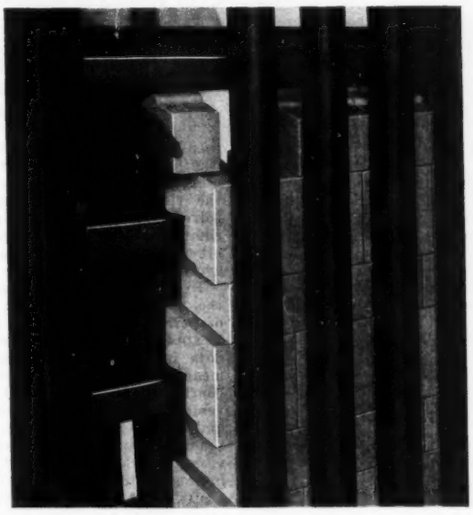
A BRIEF study of the accompanying photographs will indicate why so many refiners have found it to their advantage to use Bigelow Unit-Suspended Walls and Arches on their oil heaters. Adaptability, low maintenance, long life, structural stability and construction economies are the characteristics of Bigelow Walls and Arches that have made them particularly suited to the needs of the modern refinery.

Additional information upon Bigelow-Liptak products will be found in the Composite Catalog of Oil Refinery and Natural Gasoline Plant Equipment. We shall also be glad to work with you in the solution of any furnace problem that you may have.



Photograph at left shows how easy and simple it is to remove and replace the wall blocks (only one refractory shape) and standard fire brick in the Bigelow Unit-Suspended Wall. Each block is independently supported and can be replaced without disturbing any other block; the refractory does not carry the wall load and there is complete compensation for expansion and contraction. There are no vertical joints over 8″ long, thereby reducing the possibility of air infiltration or gas leakage.

Note how the brackets lock the blocks firmly in place and prevent bulging of the wall. The supporting steel is completely shielded from the heat of the furnace by a maximum effective thickness of refractory material.



Bigelow Walls and Arches are in use on the following well known types of oil heaters:

Alco	Holmes-Manley
Badger	Jenkins
Cross	Lientz
De Florez	McKee
Dubbs	Pratt
Foster Wheeler	Winckler-Koch

And various other types developed by refiners for their own use.

The Bigelow Type LB Unit-Suspended Wall is used primarily in connection with tube banks where it is necessary to erect and maintain the wall from *outside* the setting. Note the unit suspension principle and the ease with which the individual wall blocks are removed and replaced from outside the furnace.

The upper block (sliding in from the rear) locks the entire refractory unit (consisting of one upper and one lower block) between two brackets. A zig-zag joint separates the adjoining double rows of refractory; this insures the slight expansion joint remaining tight. The vertical joints between blocks are also staggered. The sloping contact plane between upper and lower blocks and the resulting wedge action of the upper blocks make it impossible to pull the lower blocks toward the inside of the furnace. This is also impossible with the upper blocks because of their holding lugs at the top.

Note the uniformity of wall surface that is possible with the evenly formed dry press refractory shapes. Clearance between tubes and wall is therefore reduced to a minimum.

Slab or plastic insulation is easily applied to the rear of the Type LB Wall.

Each "unit" of the Bigelow Arch is entirely independent of every other "unit." Erection of the Bigelow Unit-Suspended Arch from *outside* the furnace makes it particularly desirable where roof tubes are used. There is no cumulative loading of the refractory, and each "unit" is free to expand and contract without imposing stress on itself or adjacent "units," thereby eliminating the principal cause of spalling and greatly increasing the life of the arch.

The time usually necessary to cool down an oil heater for cleaning or repairs can be greatly reduced by quickly removing (from *outside* the furnace) several "units" from the Bigelow Arch to give the hot gasses this natural and rapid avenue of *escape*.

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BIGELOW-LIPTAK

A SUSPENDED WALL AND ARCH FOR EVERY FURNACE

Applying Viscosity Index to Solution of Lubricating Problems

* * * * * *

By G. H. B. Davis*, M. Lapeyrouse*, and E. W. Dean†

The system of classification of lubricating oils according to viscosity index has proved useful to petroleum technologists, automotive engineers and chemists. Its usefulness has been increased by various investigators who have prepared convenient charts.

In this article a compilation of the more useful data and charts on viscosity index is given. A discussion of the application of viscosity index to lubricating problems is also included. In this it is indicated that the viscosity index of an oil has a direct bearing on (1) ease of cold weather starting, and (2) oil consumption in the engine.

The viscosity of a lubricating oil at the operating temperature is probably its most important single characteristic, but the selection of the proper lubricating oil for any given service is often complicated by the fact that all types of oil do not show the same rate of

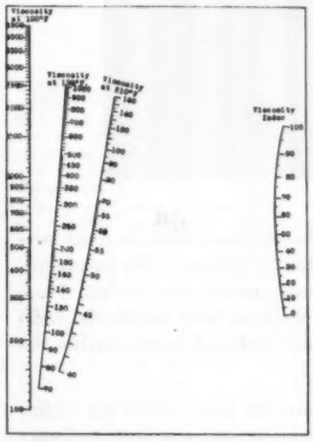


Figure 2—Alignment chart for estimation of viscosity index.

change in viscosity with change in temperature. In order to facilitate the proper selection of lubricants for different purposes, a system of classification according to viscosity index was developed by Dean and Davis.[6] In this system, the viscosity-temperature coefficient of an oil is expressed as a simple function of its Saybolt Universal viscosities at 100° and 210° F. This function, which they named viscosity index, was found to be independent of the actual viscosity of a given oil and to have the nature of a constitutive property of the oil. The numerical value of viscosity index is readily calculable according to the formulas derived by the authors or may be obtained directly from charts based on the formulas.

The convenience of this method of expressing the viscosity-temperature coefficient of an oil is attested by the use of the system of viscosity index in the recent literature on petroleum technology, petroleum chemistry, and automotive lubrication. Viscosity index was taken by Haslam and Russell[3] as a measure of the improvement, as to temperature-viscosity relationship, of low quality lubricating distillates by the hydrogenation process. Ellis[7] has used viscosity index in the same connection in the most recent edition of his book on hydrogenation. The same system has been adopted by Sullivan and his coworkers[14]

* * * *

as a measure of the viscosity-temperature coefficient of their synthetic lubricating oils. Davis and McAllister[8] showed how the viscosity index of various fractions solvent-extracted from a lubricating distillate could be used in conjunction with other characteristics for estimating the average chemical structure of the oil.

In view of the foregoing evidence of the use of viscosity index in the work of petroleum technologists and chemists, it appears timely to review the original data in connection with recent developments, to compare the various forms of charts which may be used for the convenient determination of viscosity index, and also to indicate briefly a few of the practical instances in which a study of viscosity index facilitates the selection of lubricants to meet the various requirements of the automobile industry.

Basic Data for Derivation

Basic figures used in developing the system of viscosity index were obtained by the accurate determination of the Saybolt viscosities at 100° and 210° F. of a number of samples derived from two extreme types of crude oil. The series of oils having a small change of viscosity with temperature was assigned a value of 100 viscosity index and the oils having a large viscosity-temperature coefficient were given a value of 0 viscosity index. The viscosities at 100° F. of the samples from each series were plotted against the corresponding viscosities at 210° F. and two graphs were obtained for which the equations were found to be as follows:

For 100 V.I. : $Y = 0.0408X^2 + 12.568X - 475.4$

For 0 V.I. : $Y = 0.2160X^2 + 12.070X - 721.2$

where Y is viscosity at 100° F. and X is viscosity at 210° F. These equations

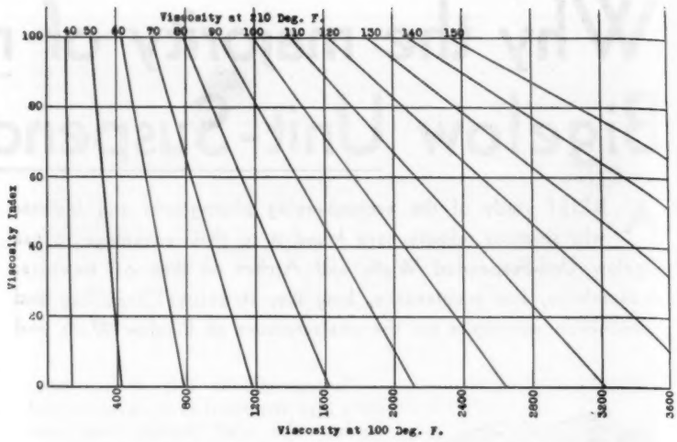


Figure 1—Graphic estimation of viscosity index.

* * * * * * * *

fitted the experimental values closely as may be seen from the comparison of calculated values with the actual viscosities given in Table 1, in which the oils of 100 viscosity index are listed as Series H and the oils of 0 viscosity index are designated as Series L. On the basis of these equations, the viscosity index of any oil of unknown series (U) was defined by expressing the difference between its viscosity at 100° F. and the viscosity at 100° F. of the oil in Series L having the same viscosity at 210° F. as the given oil, as a percentage of the difference between the viscosities at 100° F. of the oils of Series L and Series H having the same viscosity at 210° F. as the given oil. The mathematical expression of the definition was stated as follows:

$$V.I. = \frac{L - U}{L - H} \times 100 = 100\,(L - U)\,/D$$

where V.I. is viscosity index; U is the viscosity at 100° F. of the oil in question; L, H are respectively the viscosities at 100° F. of the Series L and Series H oils having the same viscosity at 210° F. as the oil in question; and D is a symbol for the difference (L — H).

Viscosity Index of Oils with Viscosity at 210° F. Less Than 50 Saybolt

Dean and Davis[6] prepared a table of values obtained from the above equations, showing the values of L, H and D for every value of viscosity at 210° F. between 40 and 160. They noted, however, that the charts based on these values gave an unavoidable exaggeration of the importance of differences in viscosity indexes for the lower viscosity oils. This exaggeration was inconsequential when the viscosity index was used merely as an indication of the type of crude from which an unknown lubricating distillate was obtained; but when the system of viscosity index was applied to the problems of synthesis[14] and analysis[8] of lubricants, slight differences in viscosity index became important.

Winning[15] pointed out that the limits of accuracy of the Saybolt viscosity determination as required by the American Society for Testing Materials[1] in their standard method of test No. D88-30 are plus or minus 1 per cent and that an accuracy of 1 per cent, while permitting an average error of only 2½ points in viscosity index for oils of 100 Saybolt viscosity at 210° F., would permit an average error of 33 points in viscosity index for an oil of 40 Saybolt viscosity at 210° F., according to the original viscosity data of Dean and Davis[6]. This fact indicated that, in order to increase the accuracy of viscosity index determinations for oils of low viscosity, it was necessary to determine the viscosities with greater accuracy than was attainable with the Saybolt Universal viscosimeter. Accordingly, Sloane and Smith[13] redetermined the viscosities of a number of samples of oil from Series H and Series L, of which the Saybolt viscosities at 210° F. were less than 50 seconds, using a modified Ostwald viscosimeter, and converting the kinematic viscosities thus obtained into Saybolt viscosities.

These were found to deviate from the values calculated according to the equations of Dean and Davis[6]. These revised data for the oils of viscosity at 210° F. less than 50 seconds Saybolt, together with the original data of Dean and Davis[6] for the oils of Series H and Series L with viscosity at 210° F. greater than 50 seconds Saybolt are given in Table 2. This table also includes for each viscosity at 210° F. a figure representing the difference (D) between the calculated viscosities of the Series L and Series H oils. In using this table it should be borne in mind that the viscosities of oils with viscosity at 210° F. less than 50 seconds Saybolt should be determined with an Ostwald viscosimeter where special accuracy is required.

Charts for Determination of Viscosity Index

Figure 1 gives the original graphical method for estimating viscosity index without making arithmetical calculations based on Table 2. The chart is used by following the oblique line corresponding to the viscosity at 210° F. of the oil in question until it intersects the value of the viscosity at 100° F., and then following a horizontal line to the viscosity index scale at the left of the chart. Figure 2 shows a more recent nomographic chart developed by Newell[12] from the data of Dean and Davis[6]. This chart includes values not only for the viscosities at 100° and 210° F., but also at 130° F., since viscosity is often determined at 130° F. (as for S.A.E. viscosity numbers). In Figure 2, the lower values of the scales for viscosity at 210° F. and for viscosity at 130° F. have been altered to conform with the data in Table 2. Figure 3 shows the graphs of Saybolt vis-

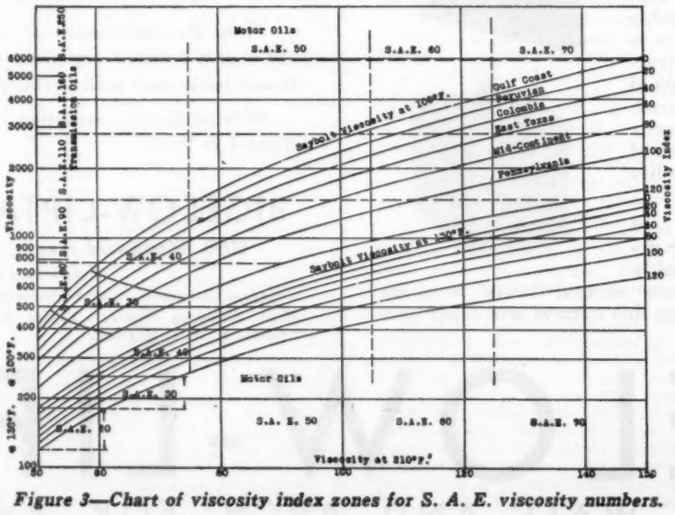


Figure 3—Chart of viscosity index zones for S. A. E. viscosity numbers.

*Standard Oil Co. of Louisiana.
†Standard Oil Development Co.

cosity at 100° F. plotted against Saybolt viscosities at 210° F. for oils of equal viscosity index at intervals of 20 points in viscosity index between 0 and 100. These intervals coincide with the typical viscosity indexes of lubricants from various types of crude as follows:

Crude type—	Viscosity index
Gulf Coast	0
Peruvian	20
Colombian	40
East Texas	60
Mid-Continent	80
Pennsylvania	100

Figure 3 also includes another series of graphs for the viscosities at 130° F. plotted against the viscosities at 210° F. for equal viscosity indexes at the same intervals of 20 points. This figure is also divided into other zones delimiting the range of the various S.A.E. viscosity numbers for motor oils and transmission oils. This type of chart was published by Larson and Schwaderer[10] who merely rearranged the data of Dean and Davis[4] so as to obtain uniform spacings for the graphs of equal viscosity index; but the retention of the original graded spacings in Figure 3 appears satisfactory.

Application of Viscosity Index to Automotive Lubrication Problems

Some of the more important instances in which the viscosity index of the oils used has a direct bearing on the performance of automobile engines are as follows:

Cold Weather Starting and Lubrication

It has been pointed out by Blackwood and Rickles[8] that the average normal limits for cold weather starting must be such that the cranking speed of the starter is greater than 30 r.p.m. for a large proportion of present day cars. This requires the viscosity of the oil in the crankcase to be less than 40,000 seconds Saybolt at the starting temperature. Table 3 shows some of the data presented by those authors on the viscosities of a number of different commercial, winter grade motor oils (S.A.E. No. 20) at different temperatures. The viscosity indexes of these oils are also given in this table. These data show clearly that viscosity index has a direct bearing on the cold starting characteristics of the oils. The data indicate that, if the crankcase of an average present day car were filled with fresh oil at 0° F., only oils No. 1 and No. 2, out of this group of 14 oils of winter grade, would permit the car to be started from the cold. It will be noted that oils No. 1 and No. 2 had the highest viscosity indexes in this group. The viscosity at either 100° F. or 210° F. alone would not indicate the performance of these oils. For instance, oil No. 4 had practically the same viscosity at 100° F. as oil No. 2 but at 0° F. the viscosity of oil No. 4 exceeded the limit for satisfactory starting performance. Similarly, in Figure 5, a graphical comparison is made between the viscosities at different temperatures of oil No. 2 and oil No. 14, both of which had a Saybolt viscosity of 52 seconds at 210° F. Oil No. 2 with 105 viscosity index attained the limiting viscosity of 40,000 seconds at a temperature slightly below 0° F., while oil No. 14 with 16 viscosity index attained the same viscosity at about 22° F. These data confirm the statement made by Davis and Blackwood[4] that, for oils of the same viscosity at 210° F., the high viscosity index oils will start more easily.

In this connection it is necessary to consider the possible effects of crankcase

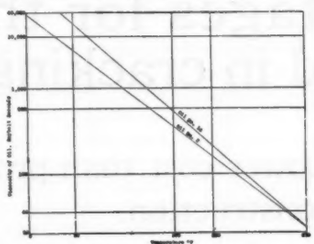


Figure 4—Viscosity of two oils at different temperatures.

dilution, because an appreciable dilution of the motor oil would decrease its viscosity and consequently its effect on the starting torque. With present day fuels and present day cars, however, the tendency for crankcase dilution is very slight. Thus Lane and his coworkers[9] have shown that the endpoint of winter grade motor gasolines has decreased from an average of 431° F. in 1921 to an average of 401° F. for 1931. With the latter type of gasoline, crankcase dilution would be less likely to occur, especially with crankcase ventilation such as is provided in present day cars. Mougey[11] states that dilution cannot be relied upon to solve the problem of cold starting, since driving at high speeds and temperatures removes dilution, thus raising the viscosity of the oil and making cold starting the following morning difficult or impossible.

The above discussion shows the importance of the influence which viscosity index has on the performance characteristics of motor oils for cold weather starting; but, after starting, the viscosity index of the oil also has an important influence on its lubrication characteristics. An important requisite for adequate lubrication while the engine is warming up is that the oil must spread readily over the cylinder walls. Becker[2] has pointed out that viscosity at the crankcase temperature is as important as is the pour-point and he has recommended that, after starting a cold engine, it should be idled until lubrication is fully established, as otherwise the cylinder walls and bearings may be scored. The data in Table 3 and in Figure 4, showing how the viscosity index influences the viscosity of an oil at low temperatures, indicate that the oil with the lowest viscosity at the start ing temperature will spread most readily over the cylinder walls.

Oil Consumption

The problems of starting and operating the engine in cold weather as discussed previously are closely associated with the problems of oil consumption. Mougey[11] explained the relationship as follows: The oils suitable for winter operation, as regards cold weather starting, will have a low viscosity under high speed operating conditions and will result in high consumption under such conditions.

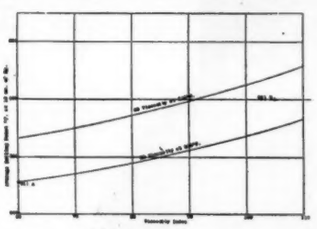


Figure 5—Relationship between viscosity index and volatility of motor oils.

As a result, the motorist uses oils of higher viscosity to obtain more miles per gallon and thus increases the starting and winter lubrication problems. Mougey[11] pointed out that this cycle of lubrication ills could be broken by using an oil of low volatility which need not necessarily have high viscosity. For instance, the data of Davis and McAllister[5] confirmed by recent investigations made by the present authors, indicate that, for a given viscosity at 210° F., the volatility of ordinary lubricating oils decreases as the viscosity index increases. This average relationship is illustrated in Figure 5, in which volatility is indicated by the average boiling point of the oil at a pressure of 10 millimeters of mercury. The indications in this figure may be applied to the data presented by Mougey[11] to show that differences in volatility of two oils can be gauged by differences in viscosity index. Two oils, A and B, were used, both having the same viscosity at 100° F., but having different viscosity indexes and other characteristics as follows:

	Oil A	Oil B
Viscosity at 100°F.	322	322
Viscosity at 210°F.	50	55
Viscosity index	60	105
Viscosity at 0°F. (est.)	60,000	40,000
Flashpoint, °F.	380	430
Firepoint, °F.	450	505
Average boiling point, °F. at 10 mm. of Hg. (est.).	528	600

The average boiling points of the two oils, as estimated from their viscosity indexes with the aid of Figure 5, indicate that Oil B was less volatile than Oil A. A series of tests was made with these two oils in two different cars at several speeds. Table 4, reproducing the data presented by Mougey[11] shows that, for both cars at every speed, Oil B had a

(Continued on Page 169)

TABLE 3—VISCOSITIES OF VARIOUS OILS IN S.A.E. CLASS NO. 20 AT VARIOUS TEMPERATURES

Oil No.	Viscosity index	Viscosity in seconds Saybolt Universal at 210°F.	at 100°F.	at 0°F.
1	108	54	301	35,000
2	105	52	294	37,000
3	104	56	344	44,000
4	76	50	296	46,000
5	96	56	366	50,000
6	105	58	375	50,500
7	53	50	335	62,500
8	55	50	332	63,000
9	69	52	351	65,000
10	65	52	369	70,500
11	—2	47	325	83,000
12	19	49	357	83,500
13	—1	49	388	.....
14	16	52	459	.....

TABLE 4—OIL CONSUMPTION TESTS ON TWO OILS WITH EQUAL VISCOSITY AT 100° F.—COMPARATIVE MILEAGE OF TWO CARS

Speed	Miles per gallon of oil — Car No. 1* Oil A	Oil B	Car No. 2* Oil A	Oil B
M.P.H.				
30	1,860	Over 2,000	3,850	Over 4,000
40	750	1,160	860	2,850
50	320	460	290	470
60	....	....	170	190

*Both cars, made by different companies, had six-cylinder engines with pressure feed lubrication.

TABLE 1—EXPERIMENTALLY DETERMINED AND CALCULATED SAYBOLT UNIVERSAL VISCOSITIES OF SELECTED SERIES OF LUBRICATING OILS

Series H Vis. at 210°F.	Vis. at 100°F. Exper.	Vis. at 100°F. Calc.	Series L Vis. at 210°F.	Vis. at 100°F. Exper.	Vis. at 100°F. Calc.
49.0	242 5	238.5	42.0	180.0	166.7
53 5	313.0	313.9	46.0	280.0	291.0
59 5	414.0	417 0	50.0	420.0	422.0
67 0	545.0	550.0	55.0	570.0	596.1
76.5	727.5	725.0	59.0	750.0	742.8
89 0	971.5	966 2	63.0	930.0	896.5
105.0	1,292.0	1,294.5	71.0	1,210.0	1,224.5

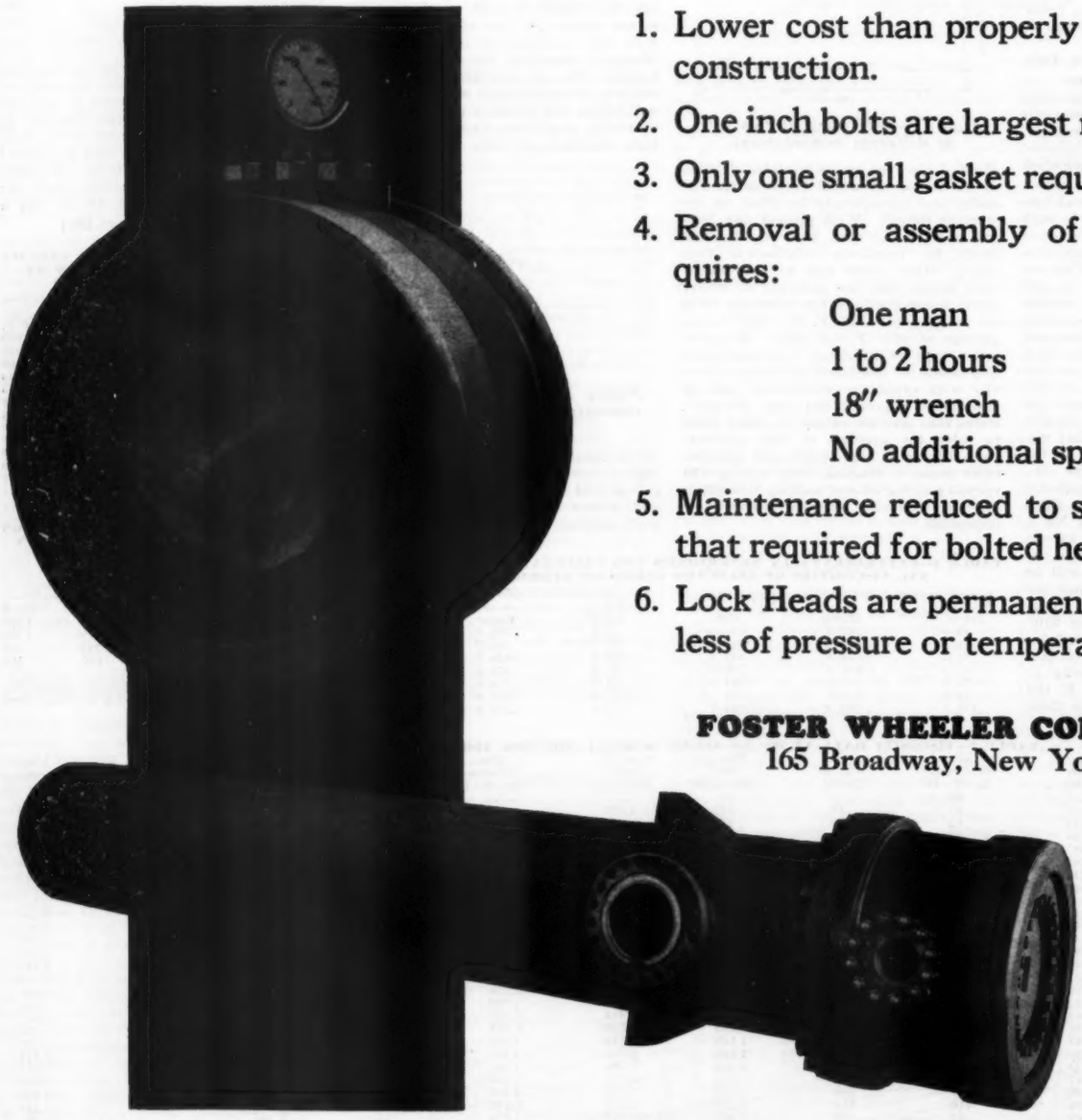
TABLE 2—VISCOSITY DATA AT 100° OF SERIES H AND L OILS FOR VISCOSITIES AT 210° F.

Visc. at 210°F.	Visc. at 100° Series H	Visc. at 100° Series L	Visc. difference L—H=D	Visc. at 210°F.	Visc. at 100° Series H	Visc. at 100° Series L	Visc. difference L—H=D	Visc. at 210°F.	Visc. at 100° Series H	Visc. at 100° Series L	Visc. difference L—H=D
*40	107	138	31	...	...	....	....	....	....	....	....
*41	120	161	41	81	810	1,674	864	121	1,643	3,902	2,259
*42	133	185	52	82	829	1,721	892	122	1,665	3,966	2,301
*43	147	210	63	83	849	1,769	920	123	1,688	4,031	2,343
*44	161	237	76	84	868	1,817	949	124	1,710	4,097	2,387
*45	176	265	89	85	888	1,865	977	125	1,733	4,163	2,430
*46	191	293	102	86	907	1,914	1,007	126	1,756	4,229	2,473
*47	206	322	116	87	927	1,964	1,037	127	1,779	4,296	2,517
*48	222	353	131	88	947	2,014	1,067	128	1,802	4,363	2,561
*49	239	386	147	89	966	2,064	1,098	129	1,825	4,430	2,605
*50	257	422	165	90	986	2,115	1,129	130	1,848	4,498	2,650
51	272	456	184	91	1,006	2,166	1,160	131	1,871	4,567	2,696
52	288	491	203	92	1,026	2,217	1,191	132	1,894	4,636	2,742
53	305	526	220	93	1,046	2,270	1,224	133	1,918	4,705	2,787
54	322	561	239	94	1,066	2,322	1,256	134	1,941	4,775	2,834
55	339	596	259	95	1,087	2,375	1,288	135	1,965	4,845	2,880
56	356	632	276	96	1,107	2,428	1,321	136	1,988	4,915	2,927
57	374	669	295	97	1,128	2,481	1,353	137	2,012	4,986	2,974
58	391	706	315	98	1,148	2,536	1,388	138	2,036	5,058	3,022
59	408	743	335	99	1,168	2,591	1,423	139	2,060	5,130	3,070
60	426	781	355	100	1,189	2,646	1,457	140	2,084	5,202	3,118
61	443	819	376	101	1,210	2,701	1,491	141	2,108	5,275	3,167
62	461	857	396	102	1,231	2,757	1,526	142	2,132	5,348	3,216
63	478	897	419	103	1,252	2,814	1,562	143	2,156	5,422	3,266
64	496	936	440	104	1,273	2,870	1,597	144	2,180	5,496	3,316
65	514	976	462	105	1,294	2,928	1,634	145	2,205	5,570	3,365
66	532	1,016	484	106	1,315	2,985	1,670	146	2,229	5,645	3,416
67	550	1,057	507	107	1,337	3,043	1,706	147	2,254	5,721	3,467
68	568	1,098	530	108	1,358	3,102	1,744	148	2,278	5,796	3,518
69	586	1,140	554	109	1,379	3,161	1,782	149	2,303	5,873	3,570
70	604	1,182	578	110	1,401	3,220	1,819	150	2,328	5,949	3,621
71	623	1,225	602	111	1,422	3,280	1,858	151	2,353	6,026	3,673
72	641	1,268	627	112	1,444	3,340	1,896	152	2,378	6,104	3,726
73	660	1,311	651	113	1,466	3,400	1,934	153	2,403	6,182	3,779
74	678	1,355	677	114	1,488	3,462	1,974	154	2,428	6,260	3,832
75	697	1,399	702	115	1,510	3,524	2,014	155	2,453	6,339	3,886
76	716	1,444	728	116	1,532	3,585	2,053	156	2,478	6,418	3,940
77	734	1,489	755	117	1,554	3,648	2,094	157	2,503	6,498	3,995
78	753	1,534	781	118	1,576	3,711	2,135	158	2,529	6,578	4,049
79	772	1,580	808	119	1,598	3,774	2,176	159	2,554	6,659	4,105
80	791	1,627	836	120	1,620	3,838	2,218	160	2,580	6,740	4,160

*All values corresponding to these viscosities were calculated from data obtained with a modified Ostwald viscosimeter.

Lock Head Exchangers for High Pressures

Lock Head heat exchangers provide outstanding advantages for the high pressures encountered in cracking plants:



1. Lower cost than properly designed bolted construction.
2. One inch bolts are largest required.
3. Only one small gasket required.
4. Removal or assembly of Lock Head requires:
   - One man
   - 1 to 2 hours
   - 18″ wrench
   - No additional space
5. Maintenance reduced to small fraction of that required for bolted heads.
6. Lock Heads are permanently tight regardless of pressure or temperature changes.

FOSTER WHEELER CORPORATION
165 Broadway, New York, N. Y.

Above: Head of 32″ I. D. exchanger under 3000 lb. per sq. in. hydrostatic test. Largest bolt—one inch.
Below: Same head assembled in heat exchanger.

FOSTER WHEELER

Low Viscosity Oils Lubricate the Motor More Satisfactorily

* * * * * *

By C. T. Doman
Research Engineer, H. H. Franklin Mfg. Co.

LUBRICATING oils of relatively low viscosity are favored in the results of block tests conducted in the H. H. Franklin Manufacturing Company's research laboratories. These results show that the correct choice of an oil of low viscosity lowers the operating temperature of the motor, reduces friction losses and more useful power is delivered for driving. Oils of relatively low viscosity are especially favored for winter use because they afford easier starting.

The author also points out the disadvantages in the use of oils that have higher viscosities than necessary.

The following tabulation of results serves as the basis for these statements.

TABLE 1—TABLE SHOWING TEMPERATURE OF OILS OF DIFFERENT VISCOSITIES GOING TO THE BEARINGS WHEN THE ENGINE IS OPERATED OVER A WIDE RANGE OF SPEED AND POWER OUTPUT.

		Temp. in °F. of oil gauge to main bearings			
R.P.M.	H.P. Load	S.A.E. No. 30	S.A.E. No. 40	S.A.E. No. 50	S.A.E. No. 60
1,000	4.5	140	150	156	168
1,500	9.5	170	181	186	197
2,000	17.5	201	211	218	228
2,500	30.0	232	244	249	259
3,000	52.0	264	274	280	288

TABLE 2—TABLE SHOWING POWER OUTPUT AND LOSS OF POWER DUE TO USING HIGHER VISCOSITY OILS THAN NECESSARY

	Continuous brake horsepower output			
R.P.M.	S.A.E. No. 30	S.A.E. No. 40	S.A.E. No. 50	S.A.E. No. 60
1,000	35.0	34.2	33.7	33.2
1,500	53.5	52.7	52.0	51.3
2,000	71.0	70.0	68.9	68.0
2,500	82.5	81.2	80.0	79.2
3,000	87.0	85.5	84.0	82.5
	Friction horsepower			
R.P.M.	S.A.E. No. 30	S.A.E. No. 40	S.A.E. No. 50	S.A.E. No. 60
1,000	4.5	5.3	5.8	7.3
1,500	9.5	10.3	11.0	11.7
2,000	16.0	17.0	18.1	19.2
2,500	22.0	22.8	24.3	26.1
3,000	30.0	31.5	33.0	34.5

In the spring of 1931 the H. H. Franklin Manufacturing Co. undertook a series of tests in which it aimed to show the relation of oil viscosity to oil temperature, oil viscosity as related to power output, and oil temperature as related to engine load.

In these tests a production Series 15 Franklin air-cooled engine was used. This engine had six cylinders of 3½-inch bore and 4.75-inch stroke. No auxiliary air was supplied to cool the engine other than that supplied by the regular cooling fan. These tests, of course, were conducted on the dynamometer where test conditions could be kept constant or rather under control.

The first test was run at normal road load. That is, the load was equivalent to that required to drive a standard sedan on a level road with no wind blowing. In this test it was desired to show the relation of the temperature of the oil going to the main bearings with various viscosities. The results are given in Table No. 1.

This table is perhaps of interest to the driver who has been told that heavier oil will make his engine run cooler. With each viscosity the temperature of the oil is increased over the oil with the next lower viscosity number.

In as much as the heavier oils gave higher temperatures it was decided to make accurate measurements of power output with each viscosity oil. These tests immediately showed a decrease in power and an increase in engine friction with each increase in oil viscosity. This data is given in Table No. 2.

This group of tests were very tediously executed since each run was continued until the oil temperature had become constant. Unless this had been done, the results would have been valueless.

While still commenting on the above group of tests it might be of interest to mention that the gasoline consumption increased with the increase in viscosity. In other words, the driver must pay uselessly out of his own pocket for the use of the heavier oils.

In as much as these tests were being run on an air-cooled engine it was first thought that the air-cooled cylinder with its so-called higher operating temperature might be responsible for the high oil temperatures. Consequently, two comparative tests were run. In the first the engine was fired at normal road load while in the second the engine was driven by the dynamometer. In this test S.A.E. No. 60 oil was used. For test results Table No. 3 is given.

TABLE NO. 3.

	Oil temperature, °F.	
R.P.M.	Firing	Motoring
1,000	168	165
1,500	200	194
2,000	228	218
2,500	258	238
3,000	288	256
	Max. cyl. wall temp., °F.	
R.P.M.	Firing	Motoring
1,000	353	160
1,500	360	176
2,000	363	185
2,500	387	202
3,000	400	218

It may be of interest to mention that similar tests on an 8-cylinder water-cooled engine showed approximately the same temperature difference between firing and motoring. These tests then prove that a well designed air-cooled engine does not run higher oil temperature than a well designed water-cooled power plant.

In order to avoid a misunderstanding regarding the operating oil temperatures of the Franklin engine it may be well to state that the maximum temperature encountered on the road is 225° to 235° F. on a hot summer day with S.A.E. No. 40 oil. The dynamometer tests, of course, are always higher due to the fact that no cooling is applied comparable with the cooling on the oil sump resulting from the passage of the car through the air.

In each case of oil temperature we refer to the temperature in the lead to the main bearing. Oil sump temperature alone means nothing. The oil lies in the sump in layers. These layers often vary as much as 120° F. In one of our road tests with a thermometer in the sump the thermometer registered 115° F. and in a bearing lead 235° F. Until we had read the thermometer in the lead we were of the opinion that our power plant had suddenly developed an inherent refrigerating plant. However, we were soon disillusioned.

* * * *

To return to these tests; this discussion will mean but little unless some practical suggestion can be made. The use of too light an oil may result in scored cylinders and burned out bearings. However, the use of too heavy an oil may result in even more motor ills. Some of them are as follows:

1. Poor performance—lack of power.
2. Premature wrist pin knocks—galling of wrist pin bearings.
3. Piston scoring—lack of lubrication when first starting.
4. Hard starting in cold weather.
5. Increased crankcase dilution resulting from the necessity of more carburetor choking.
6. Decreased economy.
7. Premature bearing wear due to lack of oil in circulation when entire power plant is cold.
8. Overload pump gears when engine is cold.

The correct selection of viscosity, of course, varies with each power plant. However, the average driver will find S.A.E. No. 40 very satisfactory for fast summer driving and S.A.E. No. 30 for mild winter driving. For extreme cold weather S.A.E. No. 20 is recommended.

The greatest protection an engine can have in the winter time is an oil which will first permit the starter to crank the engine fast enough for a quick start. Second, an oil which will keep the engine friction low enough so that the engine has torque enough to keep firing and third an oil which is thin enough to flow instantly and lubricate at once all the internal parts of the engine. A properly selected winter oil will do more to insure quick starting and general owner satisfaction than all the trick starting devices which can be loaded onto the automobile.

The fundamental reason, of course, why heavier oils are usually advocated is to increase the viscosity at the bearing so as to eliminate metal to metal contact. Our tests, however, show that the viscosity of the oil at the bearing varies little between S.A.E. No. 30 and S.A.E. No. 60 on a very fast run. Apparently, the increased temperature resulting from the heavier oils offsets their greater viscosity based on the normal 210° F. rating.

Summing up our investigation, we found that the use of a heavy oil is not the cure for an engine which operates with very hot oil. The fundamental cure is to so design the engine that the oil on very fast driving never exceeds 225° to 230° F.

ASK REFINERS TO CONTRIBUTE SPECIMENS OF OLD EQUIPMENT

An invitation to oil men to co-operate by hunting out and donating specimens of early equipment used in the petroleum industry to depict visually its extraordinary history has been broadcast by J. R. Van Pelt, assistant director in charge of the technical division of the Museum of Science and Industry. A tentative outline of the proposed petroleum industry exhibit to be housed in the museum founded by the late Julius Rosenwald in Jackson Park, Chicago, has been prepared. Mr. Van Pelt has been advised that the State of Louisiana now holds some drilling tools that were in use as early as 1812, and it is that character of materials that he believes men in the industry can make available for the museum.

By resolution adopted at its annual meeting last November, the American Petroleum Institute invited the industry generally to participate in the preparation of an exhibit for display at Chicago's World Fair, to be known as the Century of Progress, in 1933, with the understanding that the exhibit later should be permanently housed by the Museum of Science and Industry. The museum was projected in 1926, when Mr. Rosenwald offered to give the sum of $3,000,000 to endow a technical museum for America. A bond issue of $5,000,000 was authorized by the South Park Commissioners of Chicago, and it was decided to construct a stone building modeled after the Fine Arts Building that, as a feature of the World's Columbian Exposition in 1893, was called by the celebrated Augustus Saint Gaudens "the finest thing done since the Parthenon."

The petroleum industry has been allotted a generous amount of the space reserved for geology and mineral industries. On the first floor will be housed exhibits depicting the processes of production engineering, oil field prospecting, along with transportation exhibits and a model surface and subsurface oil field. Refining processes and the handling of by-products will be shown in the economics of petroleum section in the first balcony.

"Our plans emphasize operating exhibits illustrating the technology of the industry, supplemented with historic material to contrast with modern methods," Mr. Van Pelt said, "and in addition many charts will bring out the economic phases and other problems which the industry has solved and has yet to solve. Samples of products are also provided for, although they are distinctly subordinated to the more dramatic exhibits of the processes involved in the industry."

The Museum of Science and Industry has its headquarters at 1525 East Fifty-third Street, Chicago.

New Viscometer Yields Vital Data On Flow of Greases

* * * * * *

By M. H. Arveson
Standard Oil Co. (Indiana)

In the old days a grease was just a mixture of resin oil, lime and petroleum oil and was placed on axles in the crudest manner. Modern greasing equipment and the modern machinery require much more highly specialized products. Rapid progress has been made in the control of the uniformity of products in this class, but the basic flow characteristics of greases are not so generally known. It was with the object of obtaining a clearer and more quantitative idea of these characteristics that a new instrument was built by the author for the Standard Oil Co. (Indiana) at the Whiting research laboratory.

The viscosity of a lubricating oil is its most important property, being fixed if the temperature and total pressure are fixed. (Variation with total pressure is very small in the normal range.) The analogous property of a grease, termed "apparent viscosity," is not fixed under the above conditions but varies with the rate of shear. Table 1 shows the rate of shear in a simplified case of a film between a 2-inch journal and its concentric bearing when the speed and clearances are as specified.

* * * *

TABLE 1—RATE OF SHEAR IN CONCENTRIC BEARING

(Speed, 1,800 r.p.m.)

Clearance Inch	(c.m.)	Rate of shear Seconds^{-1}
0.01	(0.025)	18,800
0.001	(0.0025)	188,000
0.0001	(0.00025)	1,880,000

In the simple case of material flowing through a tube of one-eighth-inch bore at a rate of .4 pound per minute, the rate of shear is approximately 1,000 seconds^{-1}. It appears then that an extremely large range of rate of shear is involved in the use of lubricants. In dispensing and in feeding from cups and boxes the rate of shear involved is usually in the comparatively low range from 0-1,000 seconds^{-1} and in the lubricating film from 1,000 seconds^{-1} to indefinitely large values.

Capillary methods of the conventional type have failed because air pockets and grease lumps in the sample produce irregularities in the flow which are not recorded by the quantity-time records taken. To avoid these difficulties and to effect greater precision and ease of operation, a method, believed to be novel, has been developed, consisting simply in fixing the rate of flow (with a given capillary, therefore the rate of shear) and measuring the resultant pressure at the entrance to the capillary. This principle is illustrated diagrammatically in Figure 1.

When a piston, P, is driven mechanically at a constant rate into a cylinder, C, the sample, S, is forced downward against the mercury bed, Hg, and out through capillary O mounted in the removable support, D. Mercury is displaced through a duct to the gauge until equilibrium is reached, at which time all the flow is through the capillary. The rate of efflux (or the rate of flow in centimeters per second) is thus predetermined by the speed of the piston and the bore of the cylinder, and the pressure may be read as frequently as desired. This gives a continuous direct means of observing the conditions existing in the capillary.

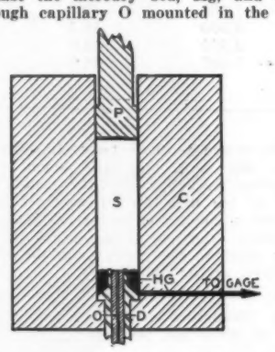


Figure 1. Principle of Constant-Shear Viscometer

[1]Note.—The term grease is used throughout in the restricted sense of a soap-thickened mineral lubricating oil.

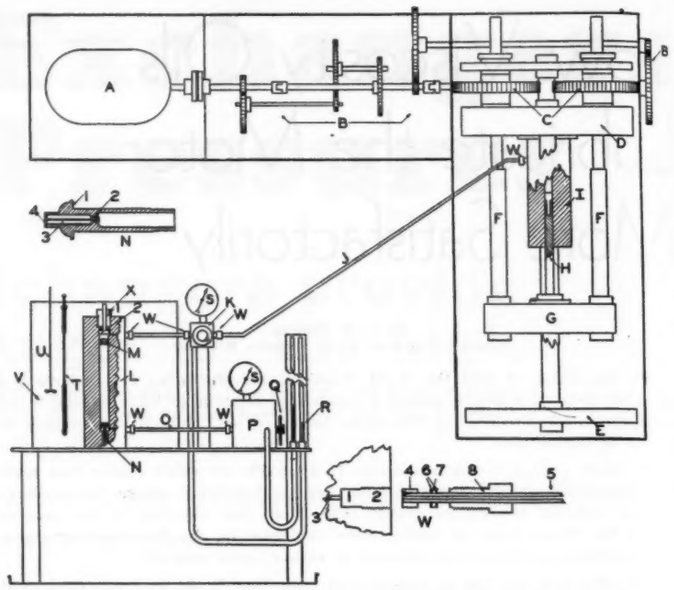


Figure 2. Schematic Drawing of Constant-Shear Viscometer

* * * * * * * *

The following definite advantages were expected and all have been realized when pressures were determined on the mercury bed:

1. Passage of air bubbles and grease lumps can be detected and the data interpreted accordingly.
2. A large number of observations at equilibrium are possible and are the only readings required during the run.
3. One capillary can be conveniently operated over a large range of efflux rates.
4. No blow holes occur.
5. A source of constant pressure over a large range is not required.
6. The capillaries are readily interchangeable.
7. The pressure differential across the capillary is measured directly.

The actual apparatus constructed is illustrated schematically in Figure 2.

A synchronous motor, A, drives an eight-speed transmission, B, which in turn drives a pair of worm gears, C, functioning as nuts drawing forward the screws, F, attached to the head, G, riding on the rails supported by plates D and E. The piston, H, constructed on the Bridgman principle (3) is attached to head, G, and in operation is forced into cylinder I, forcing the oil out of cylinder through duct J, through pressure block K into viscometer L, forcing disk M downward. The mercury from the bed about capillary N moves through duct O, then through the pressure block, P, to the manometer at R until equilibrium is reached. The sample between disk M and capillary support N-1 is forced out through the capillary, N-3 (see small detail). The method of mounting the capillary N-3 is shown. The glass capillary, 3, is ground to a shoulder as shown at 2, and cemented into place at 4 in the support, 1. The bottom of the support is threaded so that the whole acts as a bolt to be fastened into position. The top opening in the viscometer is closed by a plug, X, consisting of two parts, 1 and 2, separated on the flat face by a rubber washer. The viscometer is in a thermostat, V, controlled by mercury regulator T. The bath liquid was thoroughly agitated. Oil was first used as the liquid, but this was found to be unsatisfactory. A 15 per cent soluble oil emulsion was used with excellent results. The heat transfer was satisfactory, and no corrosion of the steel occurred.

The pressure blocks, K and P, are constructed so that gauges, S, and manometers both function with the Bridgman plug in the back position, while only the gauges function when the plug is in the forward position. The plugs are operated by two valve wheels as shown Q.

A detail, W, of the Bridgman tube connections is shown. The block has a duct, 3, a plain portion, 1, into which 4 is fitted, and a threaded section, 2, to hold plug 8. Between head 4 and plug 8, two copper washers, 6, and a rubber washer 7, are placed. Tension on the rubber seal is furnished by plug 8. When pressure is built up in the system, it applies to the full end surface of 4, producing a force which is transmitted to the rubber washer, 7, and causing pres-

(Continued on Page 167)

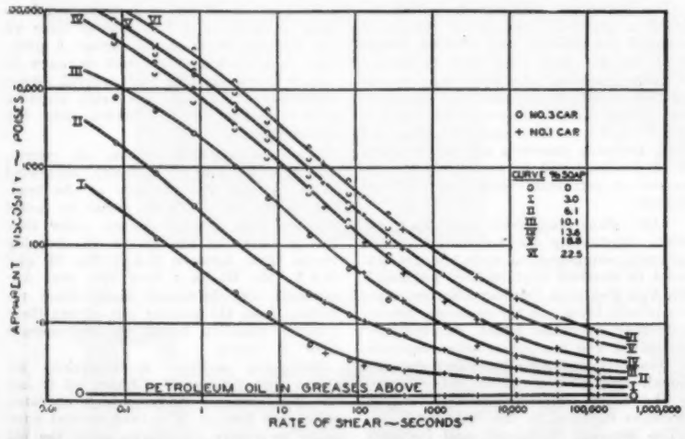


Figure 3. Apparent Viscosity-Rate of Shear Diagram of Series of Cup Greases

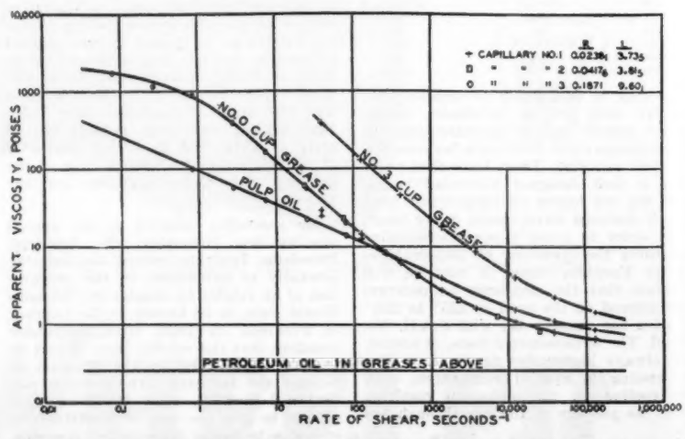


Figure. 4. Apparent Viscosity-Rate of Shear Diagram of Several Greases. They contain an oil common to all

Mr. Refiner . . .

YOUR PROBLEM IS THE COMPLEXITY OF PRESENT DAY GASOLINE

In the manufacture of present day commercial gasoline, several products, each to specification, are often blended in varying proportions. In some instances a premium grade gasoline is a blend containing all seven of the following products:

1. Straight Run Gasoline
2. Cracked Gasoline
3. Reformed Straight Run Gasoline
4. Recovered Liquid Products from Refinery Vapors
5. Recovered Liquid Products from Cracking Unit Vapors
6. Natural Gasoline Liquid Products
7. Ethyl Lead Fluid or Other Detonating Retarders

The listing of this varied number of products brings home the complexities of the refiner's problem which is to make and market commercial gasoline at a profit. To meet the varying conditions, up-to-date and efficient equipment is essential.

The adaptability of older units designed for a particular service is often not sufficient to warrant their employment for a new operation, or to obtain a result required to meet new conditions. Many consider this especially true in attempting to crack heavy oils and re-form light fractions simultaneously in the same cracking still.

The production of each of the above named products to specifications require, in part, the following equipment all of which can be provided by Arthur G. McKee & Co. and their associate Petroleum Engineering, Inc., engineering and contracting specialists for the petroleum industry:

1. Pipe Still Crude Distillation Units
2. Cracking Units*
3. Straight Run Gasoline Reforming Units*
4. Viscosity Breakers*
5. Single Flash Pressure Distillate Rerun Units
6. Recycle Pressure Distillate Rerun Units
7. Atmospheric Vacuum Pressure Distillate Rerun Units
8. Continuous Gasoline Treating Plants
9. Continuous Pressure Distillate Treating Plants
10. Refinery Vapor Recovery Plants
11. Cracking Unit Vapor Recovery Plants
12. Natural Gasoline Recovery Plants
13. Gasoline and Pressure Distillate Stabilizers
14. Absorption Plants
15. Gasoline Rectifying Plants
16. Gasoline Distillate Fractionating Stills
17. Ethyl Lead Fluid Blending Stations*
18. Acid Recovery Plants

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Arthur G. McKee & Co. plants and equipment, including complete refineries, have been built and are in successful operation in many parts of the world.

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Explains Specification Method of Purchasing Lubricating Oils for State Departments

* * * * * *

By J. P. Calderwood
Professor of Mechanical Engineering, Kansas State College

THE State of Kansas has purchased the lubricating oils used in its 27 state institutions for the last 10 years. The Kansas State Highway Commission has followed a similar practice in the purchase of the lubricating oils for all tractors, road scrapers and automobiles during the last three years. The combined contracts for these two branches of the State's service creates the purchase of about 3,000 bbls. of lubricating oils annually.

While the purchase of oils by specifications results in a considerable financial saving to the State, the practice was inaugurated more because of business necessity. In any politically controlled organization where all orders for supplies must pass through and be approved by some central office or business manager, all purchases must be defended. Before the practice of purchasing oils by specifications was made effective, practically every state institution used a different grade of oil for lubricating identical equipment. These differences naturally raised the question: Why do not all State institutions use the same brand of oil in the lubrication of the same type of equipment?

Another complication that arose in the purchasing of oil under the old system was due to the sales aggressiveness of the commercial lubricating companies. Considerable care would be exercised by the state officials in deciding upon the proper commercial oil to be used in a given case. Almost as soon as the decision was made, efforts would be made to replace the selected oil with one made by a competitor claiming superior lubricating qualities. The psychology of lubrication is an interesting problem and it does not require a great deal of persuasion to convince any man that he is using the wrong kind of lubricant. As a result, there was always a great deal of confusion and difference of opinion among the officials of the state institutions as to what oil should be properly used.

The difficulties encountered in former methods of purchase resulted in the use of specifications for all state institutions of Kansas. The operating conditions and the equipment used in the various institutions were for all practical purposes identical and the purchase of oils by specifications seemed logical. In the first attempts, a careful study of the characteristics of the commercial grades of lubricants successfully used in the state institutions was made. Specifications were then prepared using the characteristics of these commercial products as a basis, it being the desire to secure a good grade of commercial lubricant. The specified limits of the characteristics were consequently wide in order that most commercial products would be included.

After a few years of experience in letting the contracts for lubricants under these first specifications several important difficulties were encountered. While it was the desire of the State to secure under these contracts oils of a nationally known grade, they were forced to place the contracts with those companies whose price was lowest. The widespread of the specified characteristics made possible the supplying of oils whose lubricating qualities were questionable and if their price was low, some trouble was experienced in eliminating them. The well-known brands of lubricants could not meet the low prices of competing oils. Many of the small oil companies compounded special oils to meet the specifications and the prices quoted on these were very much lower than those of nationally known brands.

The net result of all this on the specifications was the gradual narrowing of the permissible characteristics.

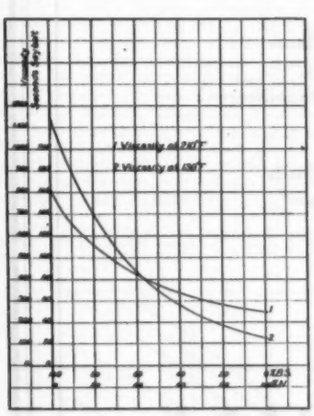


Fig. 1. Variation in viscosity of a Mid-Continent base oil when compounded with various percentages of a Mid-Continent neutral.

This meant the gradual elimination of some of the products of commercial lubricating companies. At present, few commercial oil companies find that they can meet the specifications with their nationally known grades of oil and seldom bid with the expectations of getting the contract. Most contracts go to oil companies who have facilities for oil compounding and who prepare a special oil to meet the specifications.

It will thus be seen that in purchasing oil by specifications the limits of the characteristics must of necessity be narrow. This eliminates practically all well-known brands of lubricants unless they happen to possess characteristics that will meet the specifications. Further, the purchase of lubricants by specifications usually resolves itself into the compounding of a special oil to meet the specifications, and hence in the preparation of the specifications those responsible for setting the limits should know positively what kind of an oil is wanted.

* * * *

Preparation of Specifications

Those responsible for the preparation of the specifications have many things to consider. A full knowledge of the equipment to be lubricated and the characteristics of a satisfactory lubricant is the first consideration. What characteristics are to be incorporated in the specifications must be considered. Setting the limits of those characteristics so that the specifications are rigid enough to eliminate questionable oils is the next consideration. Studying the characteristics of commercial base oils and neutrals must be given attention to see that the limits of the characteristics specified are within reason.

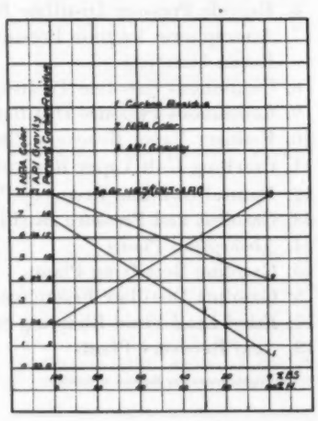


Fig. 2. Variation in carbon residue, color, and gravity of a Mid-Continent base oil when compounded with various percentages of a Mid-Continent neutral.

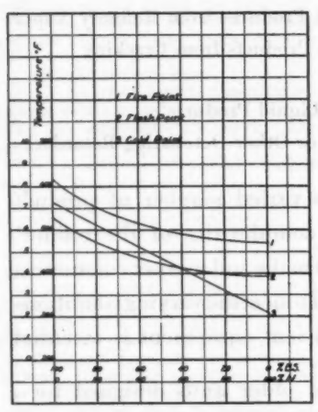


Fig. 3. Variation in firepoint, flashpoint and coldpoint of a Mid-Continent base oil when compounded with various percentages of a Mid-Continent neutral.

* * * * * * * *

An abstract of the requirements specified for the purchase of automobile lubricating oils for the state institutions of Kansas as used in the 1931 contracts is given in Table 1.

The engineering experiment station of the Kansas State College, where all lubricants for the State are tested, has done considerable investigational work upon the characteristics of compounded lubricating oils. In a recent study of this compounding problem various base oils were compounded by the addition of known percentages of neutral oils and the resulting characteristics of the compounded oils studied. Figures 1, 2 and 3 show graphically the effect upon the characteristics of compounding a Mid-Continent base oil with a Mid-Continent neutral. These results are shown more accurately in Table 2. Both oils were secured as representing standard refiners products. The base oil was rated as 150-D, 0-5 cold test; the neutral was classed as a 240 viscosity oil, color No. 4. The complete analysis of the characteristics of the two oils as determined by laboratory test are given in Table 3:

TABLE 3—CHARACTERISTICS OF A MID-CONTINENT BASE OIL AND NEUTRAL

	Base oil	Neutral oil
Viscosity 130° F.	1,160	125
Viscosity 210° F.	163	48
Flash, °F.	530	385
Fire, °F.	625	465
Color	7½	4
Specific gravity	24.0	27.3
Cold, °F	10	2
Carbon residue, %	1.37	0.11

How Data Are Used

The data shown in Figures 1, 2 and 3 and Table 2 were determined to see if

(Continued on Page 168)

TABLE 1—ABSTRACT OF SPECIFICATIONS AS USED IN 1931 FOR THE PURCHASE OF AUTOMOBILE OILS BY THE STATE OF KANSAS FOR ITS STATE INSTITUTIONS

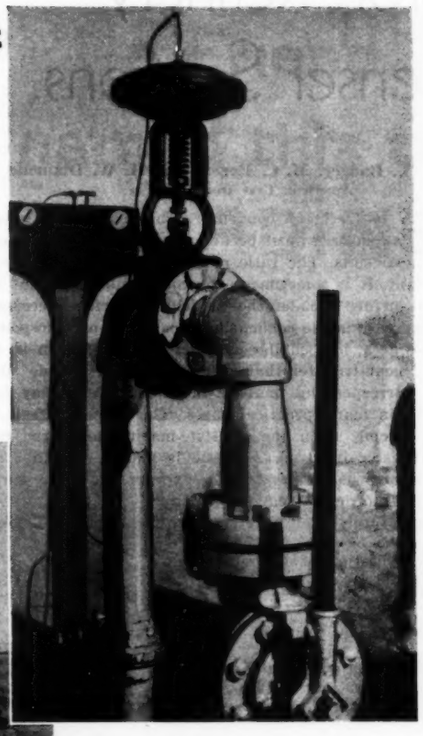
Grade—	S.A.E. No.	Specific gravity min.	Viscosity 130°F.	Viscosity 210°F.	Color N.P.A. max.	Flash min.	Fire min.	Carbon residue max.	Cold max.
A—Light	10	24°	90–115	.....	3	340°	400°	.3%	25°
B—Light medium	20	24°	120–150	.....	5	385°	435°	.5%	35°
BB—Medium	30	24°	185–220	.....	5	385°	435°	.5%	35°
C—Heavy	40	23°	255 min.	70 max.	6	420°	470°	.7%	...
CC—Special heavy	50	23°	.....	75–95	D	430°	480°	1%	45°
D—Extra heavy	60	22.5°	.....	105–120	D	450°	500°	1.5%	45°

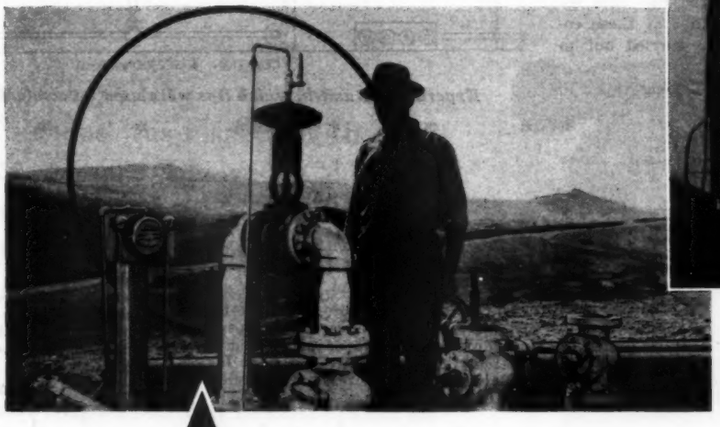
TABLE 2—CHARACTERISTICS OF AN OIL WHEN COMPOUNDED WITH VARIOUS PERCENTAGES OF MID-CONTINENT NEUTRAL AND BASE OILS

	% Neutral 100% base	10% Neutral 90% base	20% Neutral 80% base	30% Neutral 70% base	40% Neutral 60% base	50% Neutral 50% base	60% Neutral 40% base	70% Neutral 30% base	80% Neutral 20% base	90% Neutral 10% base	100% Neutral 0% base
Gravity, A.P.I.	24.0	24.2	24.5	24.7	24.9	25 5	25 65	26.0	26.5	26 7	27.3
Viscosity, 130° F.	1160	903	703	555	433	349	281	226	183	150	125
Viscosity, 210° F.	163	131	113	97	84	76	67	61	56	52	48
Flashpoint, °F.	530	495	470	460	455	440	415	405	400	390	385
Firepoint, °F.	625	515	550	535	520	510	490	485	485	475	465
Carbon res. Conradson, %.	1.37	1.35	1.04	.93	.86	.77	.58	.57	.47	.18	.11
Cold point, °F.	10	6	2	1	4	6	3	4	4	2	2
Color, A.P.I.	7½	7	6½	6½	6½	6	6	5	5	4½	4

"ONLY THE BEST"

would be selected for this control . . .





Two Fisher High Pressure Relief Valve Installations at Kettleman Hills, Calif.

A major oil company in the Kettleman Hills district needed a relief valve for 500 pound service to control within one pound plus or minus and to shut absolutely tight on no flow. Two FISHER installations are shown above. Main valves are designed, constructed, and tested especially for such service. They are controlled by FISHER'S Series 4000 WIZARD Pilots. The units are so sensitive that they operate within three-tenths of one per cent pressure variation. Only the FISHER WIZARD Pilot is capable of such control. ❖ ❖ ❖

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Heat Transfer in Cast Iron Refinery Condenser Sections

* * * * * * *

By W. L. Badger, M. C. Rogers and H. W. Diamond
American Cast Iron Pipe Co.

In the design of oil refinery condensers the inside and outside surface areas of the condensing surface must be taken into consideration in calculating the heat transfer coefficients. The ratio of the outside to inside surface areas is, therefore, important. It is sometimes erroneously supposed that a high ratio of outside to inside surface area of the condensing surface necessarily results in a proportionate increase in the condensing capacity to a corresponding section with the same inside area, but smaller external surface. It can be shown from the fundamentals of heat transfer that such increase in outside surface by no means results in a corresponding increase in capacity, and may indeed be of negligible importance in many practical cases. The precise effect of increases in outside surface depends upon the relative magnitude of the two film coefficients of heat transfer involved. As little is known of either of these coefficients for oil refinery condensers, some experiments were carried out to determine at least their order of magnitude.

An analysis of the process of heat transfer from the condensing vapor to the cooling water on the basis of film coefficients gives an indication of how much increase in capacity can be expected on account of an increase in outside area.

Since the heat, in this case, flows in series through three main resistances, namely (a) the vapor film and condensate film on the inside of the condenser, (b) the metal wall, and (c) the water film on the outside of the wall, it is convenient to base the discussion on these three resistances.

The resistance of the metal wall depends on the thickness of the wall, the thermal conductivity of the wall, and the geometric shape. Since the thickness and materials are nearly the same in all cases, and especially since this resistance only represents about 10 per cent of the total resistance, it will be neglected in the following discussion.

It is well known that the rates of heat transfer from the condensing vapor to the metal wall, and from the wall to the cooling water are measured by the corresponding film coefficients.[1] Each of the coefficients depends on a large number of variables, and relatively small variations in many of these may cause relatively large variations in the film coefficients. For example, the condensing vapor film coefficient depends on the velocity and purity of the vapor, the thermal conductivity, the specific heat, and the viscosity of the condensate film, the shape, orientation and cleanliness of the surface, and the temperature drop from the vapor to the wall. The water film coefficient will depend on the density, the viscosity, the coefficient of thermal expansion and the thermal conductivity of the water; on the shape, cleanliness and orientation of the condenser sections in the condenser box, and on whether or not the water reaches the boiling point.

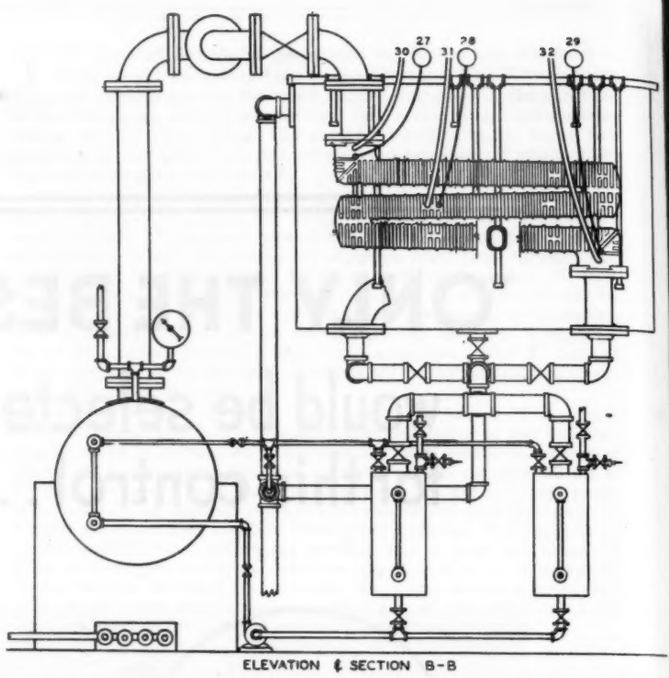
A heat transfer coefficient is defined as the heat flow in B.t.u. per hour divided by the area of the surface across which the heat is transmitted and by the temperature drop over the surface.

Thus:

$$U = \frac{q}{(A)\ (\Delta t)} \qquad (1)$$

where U = heat transfer coefficient, B.t.u. per sq. ft. per hr., per ° F.
q = heat flow, B.t.u. per hr.
A = area of surface, sq. ft.

[1]Walker, Lewis and McAdams, "Principles of Chemical Engineering," 2d ed., McGraw-Hill Book Co., 1927, pp. 134-158.
Badger and McCabe, "Elements of Chemical Engineering," McGraw-Hill Book Co., 1930, pp. 125-133.



Experimental unit in which fins were used on condenser sections

* * * *

Δt = temperature drop across surface, ° F.

Equation (1) can be written for each of the two surfaces, inside and outside:

$$q_V = (U_V)\ (A_V)\ (\Delta t_V) \qquad (2)$$

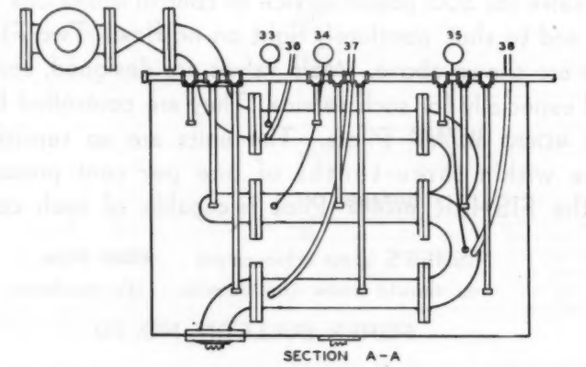
$$q_L = (U_L)\ (A_L)\ (\Delta t_L) \qquad (3)$$

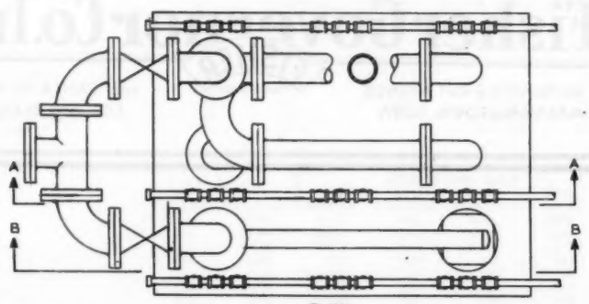
where the subscripts V and L refer to the vapor side (inside surface, and the liquid side (outside surface) respectively.

Since all the heat flowing through one surface must pass through the other, also,

$$q_V = q_L = q \qquad (4)$$

Using Equation 4 and solving Equations 2 and 3 for (Δt_V) and (Δt_L) respectively





Experiment in which smooth pipe was used as condenser sections

* * * * * * * * *

$$\Delta t_V = \frac{q}{(U_V)\ (A_V)} \qquad (5)$$

$$\Delta t_L = \frac{q}{(U_L)\ (A_L)} \qquad (6)$$

If the temperature drop through the metal is neglected, the overall temperature drop between vapor and liquid is equal to the sum of Δt_V and Δt_L. Let the overall temperature drop be called Δt. Then:

$$\Delta t = \Delta t_V + \Delta t_L = q\left(\frac{1}{U_V A_V} + \frac{1}{U_L A_L}\right) \qquad (7)$$

or the capacity of the apparatus, in B.t.u. per hour is:

$$q = \frac{\Delta t}{\frac{1}{U_V A_V} + \frac{1}{U_L A_L}} \qquad (8)$$

Consider, now, the capacities of the two sections in question. Let one section be denoted by the subscript a and let the other be denoted by the subscript b. Write Equation 8 for each of the two sections:

$$q_a = \frac{\Delta t_a}{\frac{1}{U_{Va} A_{Va}} + \frac{1}{U_{La} A_{La}}} \qquad (9)$$

$$q_b = \frac{\Delta t_b}{\frac{1}{U_{Vb} A_{Vb}} + \frac{1}{U_{Lb} A_{Lb}}} \qquad (10)$$

Divide Equation 9 by Equation 10:

$$\frac{q_a}{q_b} = \frac{\Delta t_a}{\Delta t_b}\left[\frac{\frac{1}{U_{Vb} A_{Vb}} + \frac{1}{U_{Lb} A_{Lb}}}{\frac{1}{U_{Va} A_{Va}} + \frac{1}{U_{La} A_{La}}}\right] \qquad (11)$$

Suppose the two sections be compared on the basis of the same overall temperature drop and the same inside areas, i.e., so that

$$\Delta t_a = \Delta t_b \qquad (12)$$

and

$$A_{Va} = A_{Vb} \qquad (13)$$

The Equation 11 becomes

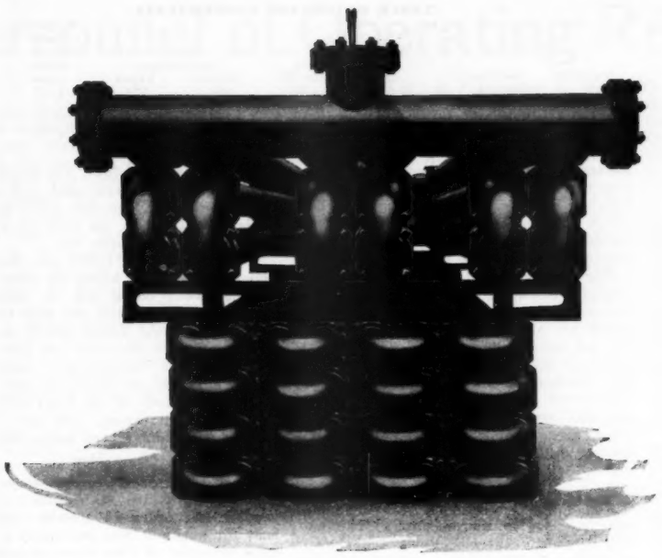
$$\frac{q_a}{q_b} = \frac{\frac{1}{U_{Vb} A_V} + \frac{1}{U_{Lb} A_{Lb}}}{\frac{1}{U_{Va} A_V} + \frac{1}{U_{La} A_{La}}} \qquad (14)$$

If the corresponding film coefficients are assumed equal in the two cases:

$$U_{Vb} = U_{Va} = U_V \qquad (15)$$

$$U_{Lb} = U_{La} = U_L$$

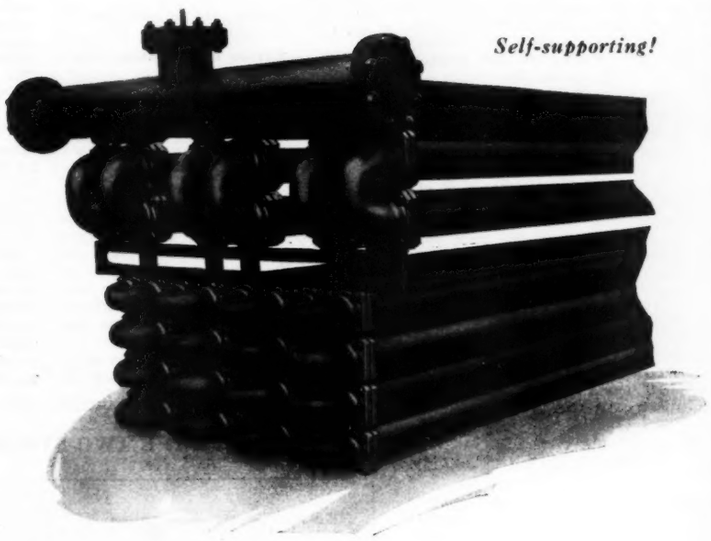
Using Equation 15 and multiplying the



Stacks perfectly!

a Friend named this the "SARDINE COIL"

Self-supporting!



RECENTLY, a visitor to our shops was inspecting the Simplex Square-Flanged Condenser Coil shown here. "You folks should name this 'the Sardine Coil'," he remarked. "I never saw such a compact coil!" Though made in a spirit of fun, his remarks emphasize the great improvement in coil construction made possible by our

SIMPLEX
SQUARE-FLANGED
CONDENSER PIPING

This piping provides an enormous space saving as compared with flanged pipe, round-flanged Simplex Pipe, or steel pipe with standard companion flanges. Space savings as high as 50% (or even greater, depending on design of coil) can be effected with this new piping. Since the flange on the pipe is square, and the flange on the return bend is a double-square, no supports for the runs are necessary, as the pipe stacks perfectly. *A greater amount of condensing area can be obtained* in a box of equal size with Square-Flanged Simplex Condenser Piping than with any other type of piping or condenser material now available. Complete details are included in our catalog "Square-Flanged Condenser Piping"—a complimentary copy of which will be mailed you on request directed to Acipco Branch Office nearest you.

AMERICAN CAST IRON PIPE CO.

BIRMINGHAM, ALABAMA

NEW YORK CITY
CHICAGO
DALLAS
MINNEAPOLIS
CLEVELAND
KANSAS CITY
SAN FRANCISCO
LOS ANGELES
SEATTLE

numerator and denominator of the right-hand member of the Equation 14 by $U_L A_V$ it follows that:

$$\frac{q_a}{q_b} = \frac{\dfrac{U_L A_V}{U_V A_V} + \dfrac{U_L A_V}{U_L A_{Lb}}}{\dfrac{U_L A_V}{U_V A_V} + \dfrac{U_L A_V}{U_L A_{La}}} = \frac{U_L/U_V + A_V/A_{Lb}}{U_L/U_V + A_V/A_{La}} \qquad (16)$$

If r is the ratio between the liquid film and the gas film coefficients, and if R is the ratio of the outside to the inside area, Equation 16 is:

$$\frac{q_a}{q_b} = \frac{r + 1/R_b}{r + 1/R_a} \qquad (17)$$

Equation 17 allows the prediction of the effect of varying the area of the outside surface on the capacity, if all other factors, including the inside surface, are identical in both cases. It isolates the effect of the magnitude of the outside area from the effects of all other variables. It must be strongly emphasized, however, that the outside area can hardly be varied without varying the water side conditions. The varied water side conditions will bring about changes in the water film coefficient, and the changes in the water film coefficient may result in a capacity change of appreciable magnitude with respect to the change brought about directly by the change on the quantity R in Equation 17.

It will be shown that the experiments indicate a value of r of 1.6 for commercial condenser sections operating on light and heavy naphthas. Thus, compare a condenser section having a value of R of 1.3 square feet outside area per square foot of inside area, with a section containing 2 square feet outside area per square foot inside area. By Equation 17 the increase in capacity brought about by an increase of

$$\frac{(2.0-1.3)}{1.3}\ (100) = 54\%$$

in the outside area should account for only a capacity ratio of

$$\frac{q_a}{q_b} = \frac{1.6+1/1.3}{1.6+1/2.0} = 1.125$$

or an increase of 12.5 per cent.

The magnitude of the secondary effects of the change in the outside area on the capacity cannot be calculated, since appropriate equations are not available. It should be pointed out, however, that a change of 12.5 per cent is a relatively small variation in heat transfer work, and minor changes in the conditions can bring about capacity changes much greater than this.

In order to apply the theoretical relationships discussed above, it is necessary to know something of the magnitude of the several film coefficients of heat transfer that are involved. As no data were available, certain experiments were carried out to determine the order of magnitude of the coefficients. In these experiments two condenser sections, one of finned pipe and one of plain pipe, were set up in a single condenser box connected to a common still. Due to the short length of pipe and the relatively large surface of the flanges, the pipe coil had nearly as great a ratio of outside surface as the finned section. Consequently, it must be emphasized that these experiments are in no sense a comparison of plain and finned sections, but merely serve to give an idea of the order of magnitude of the film coefficients.

Experimental

The first section used was a single casting containing 8 square feet of inside area and 16 square feet of outside area. Fins are cast on the outside of the section so that the ratio of outside to inside areas is 2 without excessive wall thickness. This set-up will be termed throughout the rest of the paper as "finned type section."

The second section used was constructed of cast iron pipe and detachable return bends. The ratio of outside to inside surfaces for such sections depends upon the length of pipe between return bends. If the outside area of return bends and flanges are calculated as useful surfaces, including return bends, in commercial practice, this area ratio is 1.3.

In heavy naphtha runs the pipe coil section used contained 4.2 square feet outside area and 2.6 square feet inside area. The ratio was, therefore, 1.6. For the light naphtha runs, the inside area was 8.6 square feet and the outside area was 18.1 square feet. This corresponds to a ratio of 2.1. The reason for the difference between the areas of the pipe coil section is that the return bends were lagged in the heavy naphtha runs because the temperature drop was so high in these runs that the still did not have capacity enough to operate the larger sized section used in the light naphtha experiments.

The area ratios are summarized in Table 1.

TABLE 1—RATIOS OF OUTSIDE AND INSIDE AREAS

Section—	Commercial units	Experimental units: Heavy naphtha	Experimental units: Light naphtha
Finned type	2.0	2.0	2.0
Pipe coil	1.3	1.6	2.1

Apparatus

The apparatus consisted essentially of a boiler, a condenser box containing both finned type sections and pipe coil cast iron condenser sections, condensate receivers, and the necessary vapor pipe to connect the boiler to the condenser and return lines from the condensate tanks to the boiler. The arrangement of the apparatus is shown in Figure 1.

The finned type section consists of a single casting of three runs and with 8 square feet inside and 16 square feet outside total surface area. The external surface is ribbed by protruding fins and thus offers greater outside area per unit of inside area than the pipe coil section whose outside surface is smooth.

The pipe coil section consists of four straight pieces of 4-inch nominal diameter cast iron pipe, 20 inches long, and which has an inside diameter of 4 inches and an outside diameter of 4.80 inches; and three standard cast iron return bends. The heating surface calculated from the dimensions of the pipe is 24 square feet external and 16 square feet internal. These areas include the areas of the connecting nipples exposed to the cooling water.

Thermocouples

All of the temperature measurements were made with thermocouples. The positions of the thermocouples are shown in Figure 1. The thermocouples used to measure the vapor and wall temperatures were Pyods. Their calibration curve was supplied by the manufacturer and in addition was checked in this laboratory. The potentiometer used was accurate to one-tenth of a millivolt or about 2.5° F.

Oils Used in the Experiments

There were certain limitations of the apparatus that made it necessary for oils to have certain characteristics in order to be suitable for determining heat transfer coefficients. None of these limitations, however, prevents the application of the data taken to commercial condensers.

The most important characteristic is that the oil must be a "close cut." That is, there must be a small difference between the boiling points of its lightest and heaviest fractions. This is made necessary by the small number of thermocouples with which to measure the vapor temperature. If the vapor temperature is nearly constant, the temperature drop between the vapor and wall may be easily estimated. On the other hand, if it is not, there is no way of approximating what it might be.

Furthermore, the boiler was limited in capacity so that a heavy oil with a high boiling point could not be used. The reason for this is that the high temperature drop would cause nearly complete condensation in the first few feet of the sections. Even during runs made with heavy naphtha, it was necessary to lag nearly two-thirds of the total surface on the pipe coil section, and any further lagging would have been impossible.

TABLE 2—AVERAGE COEFFICIENTS

Material	Section—	Overall coefficients: Outside	Overall coefficients: Inside	Film coefficients: Liquid	Film coefficients: Vapor	Ratio: Outside area / inside area	No. of runs in average
Heavy Naphtha	Pipe coil	52	90	200	124	1.63	3
	Finned type	44	88	187	114	2.02	3
Light Naphtha	Pipe coil	25	54	126	73	2.11	4
	Finned type	26	52	68	84	2.02	7

Operation

All of the runs were carried out under moderate pressure to insure complete venting. In order to provide sufficient heat for a run it was necessary to build up a pressure of from 5 to 10 pounds in the boiler by closing the valve in the line to the condenser section and thus to store considerable heat as heat of liquid.

In making a run, no data were taken until the temperatures were constant. Also, two or more condensate readings were taken during a run, and it was found that condensation rates were uniform.

Results

Table 2 exhibits the average coefficients obtained. It is to be noted that only three of the heavy naphtha runs of the pipe coil section are averaged in Table 2. Four other runs were made, but in these the water temperature was lower than in all other runs. This lower temperature resulted in a lower water film coefficient and a lower overall coefficient because cold water is more viscous than warm, and circulation currents not as vigorous.

It will be noted that the overall coefficients for the pipe coil section are in general very slightly higher than those for the finned type section. However, the differences are within the experimental error, except possibly the difference between outside overall coefficients in the heavy naphtha runs. (52 for the pipe coil section vs. 44 for the finned type section.)

In the light naphtha runs the water temperatures used were approximately (within about 15° F.) the same for both sections. In the heavy naphtha runs the water temperatures were varied to show roughly the change of coefficients with water temperature.

The film coefficients are not to be taken too seriously. They show, however, that the two resistances are of the same order of magnitude; and, as shown in the theory developed in the first part of the report, this checks the conclusions that neither the outside nor the inside area is of controlling importance. The film coefficients for the heavy naphtha runs are apparently more accurate than those of the light naphtha runs.

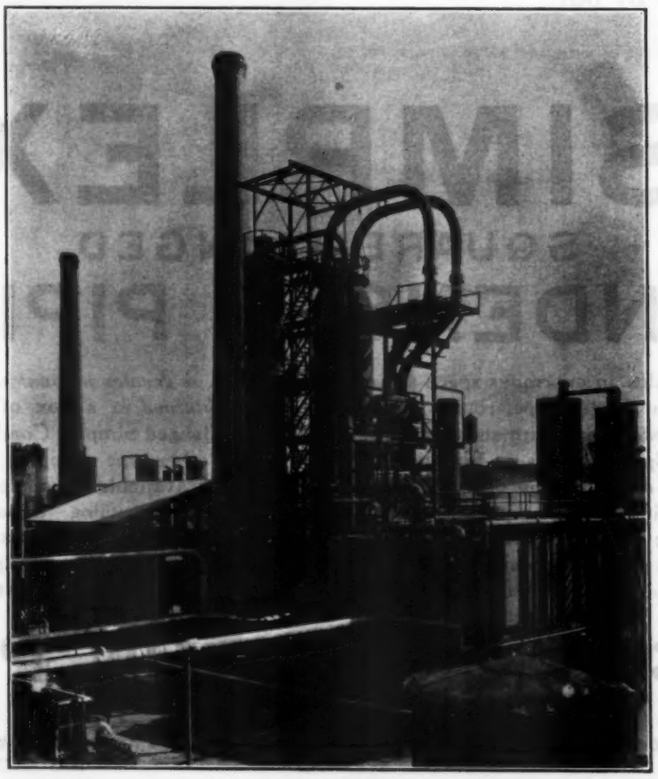
It will be noted that the variations in the overall coefficients are such that the area ratio has no apparent significance. This is especially notable in the overall coefficients based on the inside area.

Conclusions

1. Increasing the outside area of a cast iron refinery condensing section does not bring about a corresponding increase in capacity. The influence of such an increase in outside surface is of small importance in comparison with the effects of minor and unavoidable changes in more important variables influencing the heat transfer rate.

2. The overall coefficients from condensing vapors to nonboiling water in the experimental condenser box are of the order of magnitude of 90 B.t.u. per hour, per square foot inside area, per degree Fahrenheit in the case of a light naphtha, and 50 B.t.u. per hour, per square foot inside area per degree Fahrenheit in the case of a heavy naphtha.

LATEST TYPE TWO-STAGE ASPHALT UNIT



Recent two-stage asphalt unit erected at Scott & Fleming Works of the Standard Oil Co. of New York in Brooklyn. Installed by Foster Wheeler Corp.

Personnel of Operating Refineries in United States

A

(Continued from Page 60)

Archer Refining Corp., 801 City National Bank Bldg., Wichita Falls, Tex. George G. Golden, pres. and g. m.; W. H. Yeargen, sec. and treas.; W. E. Hames, supt., Megargel, Tex.; George G. Golden, s. m. (tank car) and p. a. Refinery located at Megargel, Tex.

Boris A. S. Aronow, Shelby, Mont. Boris A. S. Aronow, owner; John G. Noren, supt. at Kalispell, Mont.; Elias Hauskin, supt. at Havre, Mont.; Clyde Glosser, s. m. (tank car); Cedor Aronow, s. m. (bulk stations). Refineries located at Kalispell and Havre, Mont.

Arro Oil & Refining Co., Montana Bldg., Lewistown, Mont., H. H. Schwartz, pres.; E. L. Allen, v. p., g. m. and treas.; Guy R. Enlow, sec.; Paul Jones, supt.; T. R. Gilmour, s. m. (tank car); Paul Jones, c. c.; Ed L. Allen, p. a. Refinery located at Lewistown, Mont.

Arrow Refining Co., W. T. Waggoner Bldg., Fort Worth, Tex. F. Kirk Johnson, pres. and treas.; T. A. Hosey, v. p.; F. H. Murphy, sec.; H. B. May, g. m.; H. B. May, supt., Overton, Tex.; H. B. May, s. m. (tank car and bulk stations). Refinery located at Overton, Tex.

Ashland Refining Co., Inc., Ashland, Ky. Thomas A. Combs, pres.; T. A. Field, Paul G. Blazer, v. p.; E. L. McDonald, sec.; R. W. Grossenbach, treas.; Paul G. Blazer, g. m.; F. W. Irwin, gen. supt. of ref.; F. W. Irwin, supt., Catlettsburg, Ky.; E. F. Wells, s. m. (tank car); A. A. Hines, s. m. (bulk stations); D. H. Jenks, c. c.; R. W. Grossenbach, p. a. Refinery located at Catlettsburg, Ky.

Associated Oil Co., 79 New Montgomery St., San Francisco, Calif. William F. Humphrey, pres.; L. F. Bayer, L. D. Jurs, E. L. Shea and W. A. Sloan, v. p.; J. P. Edwards, sec.; W. A. Sloan, treas.; L. F. Bayer, v. p. in charge of mfg.; W. P. Hugo, supt., Associated, Calif.; T. O. Edwards, asst. supt.; F. E. Coyle, supt., Watson, Calif.; B. I. Graves, gen. s. m.; H. B. Haney, c. e.; L. Mittleman, c.c., Avon, Calif.; E. J. Lange, c. c., Watson, Calif.; A. P. MacKillop, p. a. Refineries at Wilmington and Associated, Calif. This company is a subsidiary of the Tide Water Associated Oil Co., New York, N. Y.

Atlantic Pacific & Gulf Refining Co., 1614 Federal Reserve Bank Bldg., Kansas City, Mo. Nelson E. Johnson, appointed receiver in equity; J. P. Howe, pres.; H. C. Mier, v. p.; Glenn W. Byrd, sec.; C. E. Howe, treas. and g. m.; William F. deHaas, gen. supt. of ref.; R. W. Jacobs, supt., Wichita Falls, Tex.; William F. deHaas, s. m. (tank car and bulk stations) and p. a.; R. W. Jacobs, c. e. and c. c. Refinery (shut down) located at Wichita Falls, Tex.

Atlantic Refining Co., 260 South Broad St., Philadelphia, Pa. J. W. Van Dyke, c. of b.; W. M. Irish, pres.; W. D. Anderson, R. D. Leonard, E. J. Henry, E. R. Cox, v. p.; W. M. O'Connor, sec.; R. H. Colley, treas.; H. M. Nichols, m. of ref.; W. F. Stroud, Jr., asst. mgr., Philadelphia, Pa.; G. E. Glines, m., B. H. Waterbury, asst. m., Franklin, Pa.; G. H. Weaver, m., R. P. Horner, asst. m., Pittsburgh, Pa.; M. J. Welsh, m., R. Stewart, asst. m, Brunswick, Ga.; R. D. Leonard, s. m. (domestic); W. D. Anderson, s. m. (export); W. Samans, c. e.; Dr. J. B. Hill, c. c.; M. F. Roberts, p. a. Refineries located at Philadelphia, Pa.; Franklin, Pa.; Pittsburgh, Pa.; Brunswick, Ga.

B

Barber Asphalt Co., 1600 Arch St., Philadelphia, Pa. Arthur W. Sewall, pres.; C. W. Bayliss, Frank Seamans, v. p.; E. R. Riter, sec.; F. J. Robertson, treas.; John H. Weller, prod. mgr.; Joseph Slutzker, supt.; H. J. Fleischer, asst. supt., Maurer, N. J.; H. C. Hottel, s. m.; Charles T. McGrady, c. e.; J. S. Miller, Jr., c. c.; John H. Weller, p. a. Refinery located at Maurer, N. J.

Barnsdall Refineries, Inc., P. O. Box 2091, Tulsa, Okla. E. B. Reeser, pres.; G. D. Locke, F. E. Holsten, v. p.; James A. Dunn, sec. and v. p.; H. M. Edinger, treas. and v. p.; F. E. Holsten, g. m.; G. T. Granger, supt., Okmulgee, Okla.; V. R. Oakley, supt., J. V. Brazier and E. B. Gray, asst. supt., Barnsdall, Okla.; Frank S. Horne, supt., Wichita, Kans.; H. M. Edinger, s. m. (tank car); O. E. Maclatchey, p. a. Refineries located at Okmulgee, Okla.; Barnsdall, Okla., and Wichita, Kans. This company is a subsidiary of the Barnsdall Oil Corp.

Bartles-Maguire Oil Co., 907 South First St., Milwaukee, Wis. A. G. Maguire, pres.; Henry J. Stolz, v. p., R. W. Fritzke, Jr., sec. and treas.; William Hildebrandt, gen. supt. of ref.; H. J. Dolan, s. m. (tank car); M. G. Peeters, s. m. (bulk stations); William Lange, c. e.; W. W. Reed, c. c.; H. A. Steffen, p. a. Refinery at East Chicago, Ind. This company is a subsidiary of the Vacuum Oil Co., Inc., New York, N. Y.

Bayou State Refining Corp., Slattery Bldg., Shreveport, La. F. M. Cook, pres., treas. and g. m.; S. M. Cook, v. p.; J. F. Knox, sec. and gen supt. of ref.; T. N. Reed, supt., Hosston, La.; F. M. Cook, s. m. (tank car); T. N. Reed, c. e.; J. F. Knox, p. a. Refinery located at Hosston, La.

Beacon Oil & Refining Co., Wichita Falls, Tex. James E. Parker, pres.; T. P. Cannon, v. p. and gen. supt. of ref.; H. W. Roberts, sec. and treas.; T. R. Cannon, supt., Henderson, Tex. Refinery located at Henderson, Tex.

Bell Oil & Gas Co., Tulsa, Okla. S. L. Lubell, pres.; Mark Finston, v. p. and g. m.; Allen Finston, sec., treas. and gen. supt. of ref.; Rex Young, supt., Grandfield, Okla.; R. Horner, supt., Pampa, Tex.; A. M. Martin, supt., Longview, Tex.; Allen Finston, s. m. (tank car); J. H. Naron, p. a. Refineries located at Grandfield, Okla.; Pampa, Tex., and Longview, Tex. Pampa and Longview plants leased from Danciger Oil & Refining Co., Tulsa. Longview plant shut down.

Berry Asphalt Co., 6 North Michigan Ave., Chicago, Ill. C. E. Miller, pres.; J. D. Berry, v. p.; H. B. Pullar, sec.; C. D. Berry, treas.; J. W. Smith, supt., Waterloo, Ark.; R. N. Smith, asst. supt.; H. B. Pullar, s. m. (tank car); A. T. Van Pelt, c. e. and c. c.; J. W. Smith, p. a. Refinery at Waterloo, Ark.

Bighorn Oil & Refining Co., 802 Fourth Ave., North, Billings, Mont. Paul Stock, pres. and g. m.; E. J. Fleming, v. p.; J. G. Everett, sec. and treas.; J. G. Everett, supt., T. R. Graham, asst. supt., Billings, Mont.; J. G. Everett, s. m. (tank car and bulk stations) and p. a.; T. R. Graham, c. e.; J. E. Simon, c. c. Refinery located at Billings, Mont.

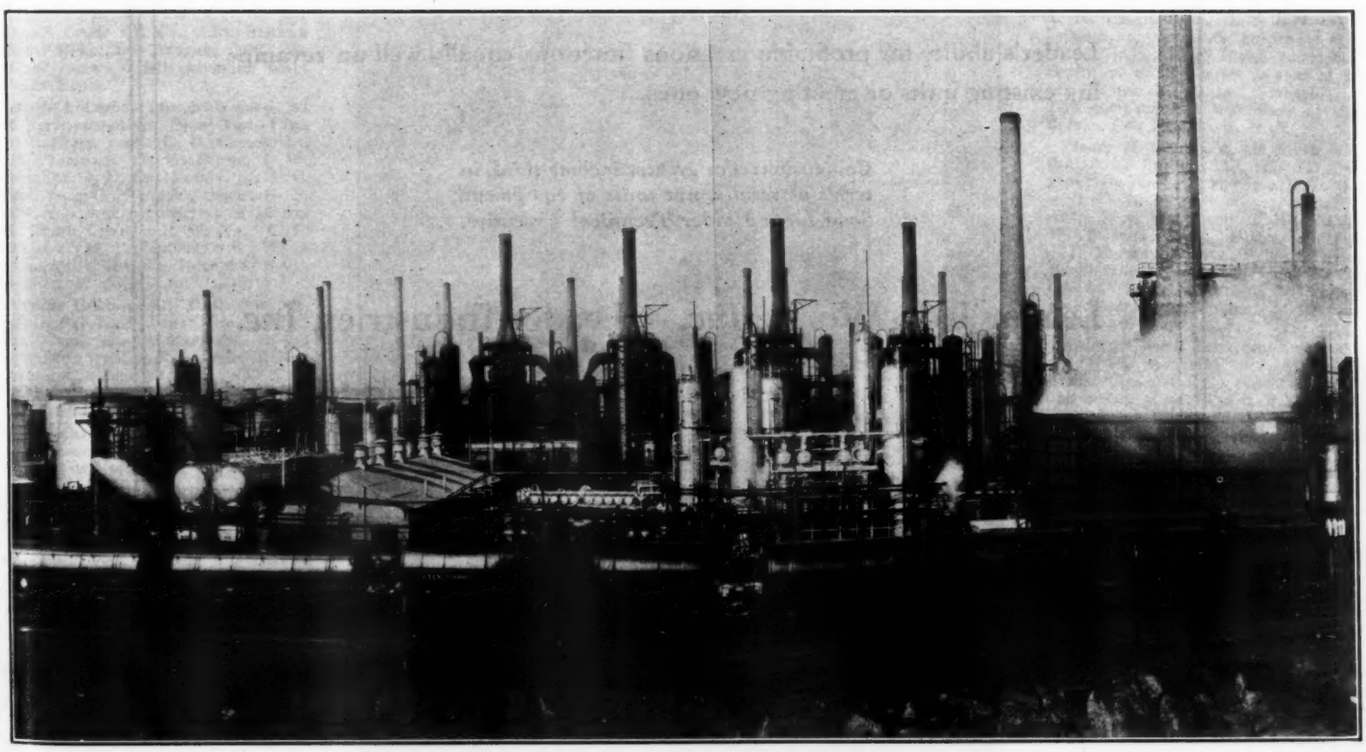
Big West Oil Co., 615 Hutton Bldg., Spokane, Wash. L. R. Hawley, pres. and g. m.; Charles P. Lund, F. D. Fobes, H. L. Bargion, v. p.; John E. Orr, sec. and treas.; M. D. Prince, asst. sec. and treas.; George Engle, supt.; Amed Soderstrom, mgr. of ref.; Amed Soderstrom, s. m. (tank car and bulk stations) and p. a. Refinery located at Kevin, Toole County, Montana.

Black Gold Refining Co., 721 Commerce Exchange Bldg., Oklahoma City, Okla. D. A. Corcoran, pres., g. m. and treas.; C. W. Scott, sec.; W. E. Netherlin, gen. supt. of ref.; W. E. Netherlin, supt., R. H. Carson, asst. supt., Oklahoma City, Okla.; C. W. Scott, s. m. (tank car and bulk stations); D. A. Corcoran, p. a. Refinery located at Oklahoma City, Okla.

Bluebonnet Oil Refining Co., 1507 Magnolia Bldg., Dallas, Tex. B. L. Wooley, pres., g. m. and p. a.; B. W. Wooley, v. p.; C. R. McClinnahan, sec. and treas.; J. T. Miller, supt., Wickett, Tex. Refinery located at Wickett, Tex.

Bobrose Oil & Refineries (a pending corporation), Smith Young Tower, San Antonio, Tex. Robert Rose, pres. and g. m.; Miller Pendleton, sec. and treas.; W. F. Cheesman, m. of ref.; C. F. Watson, s. m. (tank car); L. D. Williams, c. c.; Robert Rose, p. a. Refineries located at Luling and Brownwood, Tex.

MODERN INSTALLATIONS AT ONE OF THE INDUSTRY'S OLDEST REFINERIES



Point Breeze (Philadelphia), Pa., refinery of Atlantic Refining Co. P.D. debutanizing unit, gasoline recovery plant final stabilizing plant in foreground recently installed by Jackson Engineering Co., now Alco Products, Inc.

PROFIT

THE vision to conceive or the courage to create money-making Refineries, Vapor Recovery Systems or Natural Gasoline Plants is not, in any sense, accidental. Vision and courage, though they be backed by sound engineering and good mechanical equipment, are not alone sufficient to produce the ideal profit-making results. Such results are attained only when brains, money and materials are co-ordinated in a single balanced organization, designed solely to create such money-makers.

Leader is such a balanced organization and assures the desired results in petroleum processing problems. Its experience has been acquired in the principal oil producing countries of the world. Its good fortune lies in the combination of this experience with a seasoned engineering staff, exceptional manufacturing facilities, experienced construction and operation crews, ability to finance and a firm purpose to serve only through the creation of profitable units. Leader is truly a one profit organization.

The point of responsibility is in a single dependable organization. Leader's reputation for fair dealing and dependability means more than any guarantee that could be written.

Leader's ability for profitable creations functions equally well on revamping existing units or creating new ones.

Conclusion: For greater income think in terms of results, not units of equipment. Send for a Leader Technical Executive.

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Complete Refineries *Vapor Recovery Plants*
Gasoline Plants *Towers and Exchangers*

Engineering, Manufacturing, Construction, Finance and Operation

Personnel of Operating Refineries in United States

Boone Refining Co., Arp, Tex. C. K. West, pres.; L. F. Boone, v. p.; Fredie West, sec. and treas.; L. F. Boone, supt.

Bowling Green Refining Co., Box 605, Bowling Green, Ky. George McGinley, pres. and g. m.; John H. Wright, v. p.; H. T. Downing, sec.; M. A. Arvin, treas.; S. E. Davis, gen. supt. of ref., Memphis Junction, Ky.; D. E. Foster, s. m. (tank car); E. E. Lewis, s. m. (bulk stations). Refinery at Memphis Junction, Ky.

Bradford Oil Refining Co., Bradford, Pa. J. H. Rose, pres. and g. m.; F. D. Korner, v. p.; H. G. Barcroft, sec. and treas.; W. R. Reck, gen. supt. of ref.; James Lewis, s. m. (tank car and bulk stations); Charles Reck, c. e.; Howard Salisbury, c. e.; James Lewis, p. a. Refinery located at Bradford, Pa.

Burford Oil Co., 1405 Tower Petroleum Bldg., Dallas, Tex. F. W. Burford, pres.; John J. Thomas, v. p. and gen. supt. of ref.; E. V. Campbell, sec.; J. E. Woodworth, treas.; H. H. Knoch, supt., Pecos, Tex.; L. R. Bramer, s. m. (tank car); J. B. Cashell, s. m. (bulk stations); L. C. Atchison, c. e.; W. M. Bisett, p. a. Refinery located at Pecos, Tex.

R. R. Bush Refinery, 2790 Cherry Ave., Long Beach, Calif. R. R. Bush, owner; W. E. Snowden, g. m. and supt., Long Beach, Calif.; Neil Fox, s. m. (tank car and bulk stations); Phil Bessor, c. e. Refinery located at Long Beach, Calif.

C

California Northern Corp., 1924 Broadway, Oakland, Calif. O. F. Darling, pres. and g. m.; L. S. Flaherty, v. p.; H. J. Steiner, sec. and treas. Small lubricating oil plant operating at Coalinga.

Canfield Oil Co., P. O. Box 673, Cleveland, Ohio. Louis Carruth, pres.; Charles McLean, v. p.; H. M. Carruth, sec.; J. A. Jackson, treas.; M. C. Dippell, p. a.; R. W. Helm, supt. Refinery located at Coraopolis, Pa.

The Caminol Co., Ltd., 112 West Ninth St., Los Angeles, Calif. C. B. Colby, pres.; R. E. Hines, v. p. and g. m.; Thomas H. Lippo, sec.; R. C. Calvin, supt.; J. M. McElwain, s. m. (tank car); F. R. Shellen, s. m. (bulk station); Wayne E. Williams, c. e.; Claire L. Davies, c. e.; B. A. Sahlinan, p. a. Refinery at Santa Fe Springs, Calif.

Capitol Crude Oil Co., 1220 Subway Terminal Bldg., Los Angeles, Calif. E. P. Clark, pres. Small skimming plant at Santa Paula.

Carbide & Carbon Chemicals Corp., 30 East Forty-second St., New York City. J. A. Rafferty, pres.; G. O. Curme, Jr., H. E. Thompson, W. W. White, J. W. McLaughlin; J. D. Davidson, v. p.; A. C. Cornell, sec.; C. T. Ayres, treas.; G. B. Landes, gen. supt. of ref.; C. S. Heath, supt., South Charleston, W. Va.; C. S. Heath, c. e.; G. V. Scofield, c. e.; W. S. Ackerman, p. a. Refinery located at South Charleston, W. Va.

Carnegie Refining Co., P. O. Box 543, Carnegie, Pa. H. A. Logan, pres.; W. C. Heasley, sec.; F. G. Bannerot, treas.; Robert Burr, gen. supt. of ref.; Robert Burr, supt., Carnegie, Pa.; J. Earl French, s. m. (tank car); Charles Howk, c. e. Refinery located at Carnegie, Pa.

M. D. Carsen Refinery, Brady, Tex. M. D. Carsen, sole owner and m. Refinery located at Brady, Tex.

Century Petroleum Corp., 301 Beacon Life Bldg., Tulsa, Okla. Bob Bradshaw, receiver; E. A. Cook, gen. supt. of ref.; O. O. Ziegler, supt.; L. O. Carter, s. m. (tank car); Charles True, c. e. Refineries located at Tulsa and Oklahoma City, Okla.

Chalmette Petroleum Corp., Union Indemnity Bldg., New Orleans, La. W. E. Winship, pres.; W. Irving Moss, B. C. McClellan, Chas. Leftwich, C. D'Antoni, v. p.; D. B. Williams, asst. v. p.; R. P. Batson, sec.; William Leftwich, treas.; J. V. Gaudet, supt., J. C. Senter, asst. supt., Chalmette, La.; Louis Abramson, Jr., s. m. (tank car); Aaron Abramson, c. e.; V. G. McPherson, p. a. Refinery located at Chalmette, La.

Champion Gasoline Co., 5560 Cherry Ave., Long Beach, Calif. Rush McCrone, pres.; E. G. Fifield, v. p.; Mark Grimes, g. m.; Sidney Tauber, supt. and s. m. Refinery at Long Beach.

Champlin Refining Co., Enid, Okla. H. H. Champlin, pres. and g. m.; Fred C. Champlin, Joe N. Champlin, v. p.; D. W. Cotton, sec. and treas.; G. Ninole Wilkenson, asst. sec.; E. J. Slater, supt.; L. A. Snyder, s. m. (tank car); A. H. Holland, s. m. (bulk stations); L. E. Noble, p. a. Refinery located at Enid, Okla.

Cherry Oil Co., 2444 East South St., Hynes, Calif. Louis Steiner, pres.; Fred Steiner, v. p.; Carl Steiner, g. m. Refinery at Hynes, Calif.

Cities Service Refining Co., 260 Tremont St., Boston, Mass. Henry L. Doherty, pres.; H. D. Frueauff, W. A. Jones, J. S. Cordell, v. p.; J. V. Koons, sec.; L. F. Musil, treas.; J. S. Cordell, g. m.; L. M. Bound, gen. supt. of ref.; E. Braintree, gen. supt.; D. P. Sturges, supt.; J. A. Kelley, s. m. (tank car); T. J. Spellman, s. m. (bulk stations); H. A. Mott, c. e.; A. H. Alden, c. e.; C. L. Boyle, p. a. Refinery located at East Braintree, Mass. This company is a subsidiary of Cities Service Co., New York, N. Y.

Coastal Petroleum Co., 207 A.T.&N. Building, Mobile, Ala. Victor H. Smith, pres., sec. and treas.; C. C. Hand, v. p.; E. D. Shaffer, auditor; E. M. Coffey, supt., Mobile; O. H. Berryman, asst. supt.; W. E. McEwen, s. m. (tank car); Robert Legge, c. e.; O. H. Berryman, c. e.; Victor H. Smith, p. a. Refinery at Mobile, Ala.

Colon'al Beacon Oil Co., 20 Providence St., Boston, Mass. A. Clarke Bedford, pres.; J. R. Riddell, E. N. Wrightington, v. p.; E. N. Wrightington, sec. and treas.; D. L. Ferguson, gen. supt. of ref.; J. R. Riddell, s. m. (tank car and bulk stations); H. L. Bolton, c. e.; John Marr, c. e.; W. C. Kendrick, p. a. Refinery located at Everett, Mass. This company is a subsidiary of Standard Oil Co. of New Jersey, New York, N. Y.

Col-Tex Refining Co., 711 Colcord Bldg., Oklahoma City, Okla. L. H. Prichard, pres.; J. Steve Anderson, v. p.; P. H. Anderson, sec. and treas.; George H. Burruss, gen. supt. of ref.; L. C. McCloud, supt., Colorado, Tex.; C. L. Mayhall, s. m. (tank car); C. H. Dresser, s. m. (bulk stations); W. M. Sturges, p. a. Refinery located at Colorado, Tex.

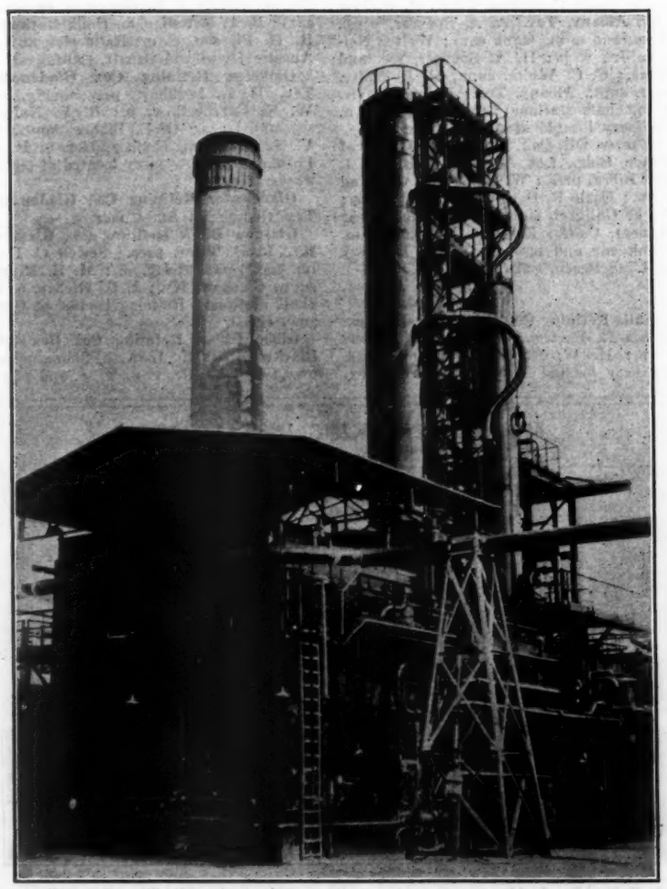
Conewango Refining Co., Warren, Pa. Fred G. Clark, pres.; Harry R. Lewis, v. p. and g. m.; Paul C. Girard, sec. and treas.; W. L. Gettings, gen. supt. of ref.; W. L. Gettings, supt., A. A. Gohn, asst. supt., North Warren, Pa.; D. C. Hughes, s. m. (tank car) A. A. Gohn, c. e.; R. S. Dawson, c. e.; Tom Moore, p. a. Refinery located at North Warren, Pa.

Conrad Refining Co., Conrad, Mont. Perry L. Withers, pres. and g. m.; A. L. Erickson, v. p.; H. D. Harrison, sec. and treas.; Ellsworth H. Withers, supt., Perry L. Withers, s. m. (tank car), p. a. Refinery located at Conrad, Mont.

Conroe Oil & Refining Co. (Grand Lake), Conroe, Tex. A. N. Munhall, pres.; Thomas Kehoe, v. p.; W. J. Pfiffner, sec. and treas.; A. N. Munhall, supt., s. m. (tank car and bulk stations), c. e., c. c. and p.a. Refinery located at Conroe, Tex.

Consolidated Pacific Refining Co., 869 Irolo St., Los Angeles, Calif. D. E. Brown and O. M. Sullivan, operators. Refinery at Santa Fe Springs, Calif.

PRESSED WAX DISTILLATE RERUN UNIT



Ponca City, Okla., refinery, Continental Oil Co. Erected by Alco Products, Inc.

Continental Oil Co., Ponca City, Okla. D. J. Moran, pres.; W. H. Ferguson, W. W. Bruce, E. J. Nicklos, Walter Miller, E. S. Karstedt, v. p.; W. W. Bruce, sec.; G. F. Smith, treas.; Walter Miller, g. m. mfg. dept.; Harold Osborn, asst. g. m. mfg. dept.; Fred G. Fellows, supt., Ponca City, Okla.; J. W. Brown, supt., Baltimore, Md.; R. H. Main, supt., Sapulpa, Okla.; D. H. Hyler, supt., Wichita Falls, Tex.; C. R. Tillman, supt., Florence, Colo.; A. M. Hovlid, Glenrock, Wyo.; C. V. Coulson, supt., Farmington, N. Mex.; Charles Morgan, supt., Artesia, N. Mex.; J. E. Fenex, supt., Denver, Colo.; H. H. Kinnaird, supt., Albuquerque, N. Mex.; L. L. Smith, supt., Lewistown, Mont.; H. J. Kennedy, s. m. (tank car and bulk stations); M. E. Clawson, c. e.; A. Henriksen, c. e.; W. H. O'Conner, p. a. Refineries located at Baltimore, Md.; Sapulpa, Okla.; Wichita Falls, Tex.; Florence, Colo.; Glenrock, Wyo.; Farmington, N. Mex.; Artesia, N. Mex.; Denver, Colo.; Albuquerque, N. Mex.; Lewistown, Mont.

Continental Refining Co., Oil City, Pa. T. A. Anderton, pres. and g. m.; M. A. DeArman, v. p.; S. S. DeArman, sec.; J. W. Anderton, treas.; C. F. Felton, s. m. (tank car and bulk stations); J. C. Vogan, c. e.; E. F. Hanna, c. e.; C. F. Felton, p. a. Refinery located at Oil City, Pa.

Cosden Oil Co., 1700 Electric Bldg., Fort Worth, Tex. George N. Moore (receiver), g. m., s. m. (tank car); E. J. Mary, supt., R. W. Henry, asst. supt., Big Spring, Tex.; S. J. Davis, c. e.; E. E. Brogden, p. a. Refinery located at Big Spring, Tex.

Crescent Oil & Refining Co., 7200 Manchester, Houston, Tex. W. J. Hepworth, pres.; W. F. Hepworth, v. p.; L. R. Hepworth, sec. and treas.; H. C. Weynand, supt., Houston, Tex.; J. L. Eggert, s. m. (tank car and bulk stations). Refinery located at Houston, Tex.

Crew Levick Co., 400 North Broad St., Philadelphia, Pa. Henry L. Doherty, pres.; Charles E. Foster, v. p. and g. m.; W. W. Martin, sec.; E. J. Hasse, treas.; J. W. Griswold, gen. supt. of ref.; C. E. Kinder, supt., A. F. Anderson, asst. supt., Titusville, Pa.; E. M. Kelly, supt., A. P. Frame, asst. supt., Petty's Island, N. J.; A. H. Irelan, s. m. (tank car); C. R. Johnson, s. m. (bulk station); E. C. Mackey, c. e.; E. F. Burch, c. e.; E. D. Erney, p. a. Refineries located at Petty's Island, N. J., and Titusville, Pa. This company is a subsidiary of Cities Service Co., New York, N. Y.

Henry H. Cross Co., 122 South Michigan Ave., Chicago, Ill. H. H. Cross, pres.; George F. Fox, v. p.; L. L. Dent, sec.; C. L. Murphy, supt., Smackover, Ark.; J. A. Wood, supt., Joliet, Ill.; W. W. Smedley, supt., Muskegon, Mich.; J. L. McAndrew, supt., Dupo, Ill.; O. B. Bingham, mgr. of refs.; Henry H. Cross Co. in charge of sales. Refineries at Smackover, Ark., Joliet, Ill., Muskegon, Mich., and Dupo, Ill.

Crown Central Petroleum Corp., Pasadena (near Houston), Tex. W. A. Williams, pres.; M. C. Ehlen, Henry A. Rosenberg, v. p.; James T. B. Bowles, sec.; Jacob Blaustein, treas.; Lee LaFerney, supt., R. F. Myers, asst. supt., Pasadena, Tex.; Jesse Stickel, s. m. (tank car and bulk stations); C. M. Johnson, c. e.; H. J. Sheard, c. e.; F. A. Pressley, p. a. Refinery located at Pasadena (Houston), Tex.

Crystal Oil Works, Oil City, Pa. Owned by E. V. Telden and J. A. Fawcett, partnership; W. B. Graham, supt, Rouseville, Pa.; J. A. Fawcett, s. m. (tank car and bulk stations) and p. a.; Henry McFadden, c. e.; John W. Fawcett, c. e. Refinery located at Rouseville, Pa.

Cushing Refining & Gasoline Co., Box 728, Enid, Okla. E. C. Mullendore, pres.; E. J. Blank, v. p.; Rex H. Winget, sec. and g. m.; M. E. James, asst. sec.; R. C. Jones, treas.; H. J. Hutchinson, gen. supt. of ref.; F. A. Davis, supt., Cushing, Okla.; J. H. Hutchinson, supt., F. C. Hutchinson, asst. supt., Blackwell, Okla.;

Personnel of Operating Refineries in United States

E. O. Derrick, s. m. (tank car); Rex H. Winget, p. a. Refineries located at Cushing, Okla., and Blackwell, Okla.

D

Dale Oil & Refining Co., 412 City National Bank Bldg., Wichita Falls, Tex. John E. Kilgore, pres.; Jack B. Dale, v. p., sec. treas., g. m. and s. m. (tank car); George A. Jennings, supt., Electra, Tex.; R. G. Jones, c. c.; George A. Jennings, p. a. Refinery located at Electra, Tex.

W. H. Daugherty & Son Refining Co., Petrolia, Pa. Dr. F. Sonneborn, pres.; S. B. Sonneborn, v. p.; R. G. Sonneborn, sec.; M. Pick, treas.; T. M. Murphy, g. m.; C. E. McGinnis, supt., Petrolia, Pa.; A. L. Larkin, s. m. (tank car); D. A. Schoerke, c. e.; F. W. Breth, c. c.; J. F. Roten, p. a. Refinery located at Petrolia, Pa.

Deep Rock Oil Corp., Atlas Life Bldg., Tulsa, Okla. John J. O'Brien, pres.; John L. Gray, R. J. Graf, L. B. Riddle, W. E. Moody, E. J. McKay, B. L. Majewski, v. p.; W. R. Francisco, sec. and treas.; John L. Gray, g. m.; W. E. Moody, gen. supt. of ref.; George Waltershausen, supt., Cushing, Okla.; B. L. Majewski, s. m. (tank car and bulk stations); R. G. Davis, c. e.; B. Frichot, c. e.; R. G. Martin, p. a. Refinery located at Cushing, Okla. This company is a subsidiary of the Byllesby interests.

Deepwater Oil Refineries, Inc., First National Bank Bldg., Houston, Tex. F. M. Law, pres.; L. F. Rothermel, v. p. and g. m.; E. L. Neville, sec. and treas.; R. Q. Traweek, gen. supt. of ref.; R. Q. Traweek, supt., I. S. Connelly, asst. supt., Houston, Tex.; L. F. Rothermel, s. m. (tank car and bulk stations); J. A. Gillen, c. c.; J. W. Painter, p. a. Refinery located at Houston, Tex.

Derby Oil Co., 352 North Lawrence, Wichita, Kans. A. L. Derby, pres. and g. m.; E. C. Moriarity, A. S. Ritchie, R. E. Wilsey, v. p.; W. E. Jett, c. of b.; E. Wasser, sec.; E. C. Claiborne, treas.; F. W. McCurry, gen. supt. of ref.; C. A. Keller, s. m. (tank car); P. J. Quinlan, s. m. (bulk stations); A. B. Hungerford, c. e.; L. C. McNamara, c. c.; R. E. Cowen, p. a. Refinery at Wichita, Kans.

Diamond Oil Co., Vermont Bldg., Salt Lake, Utah. Dr. John T. White, pres.; J. W. Musser, v. p., g. m. and p. a.; John Shewell, sec. and treas.; J. W. Musser, supt. at Virgin City, Utah; C. W. Buskick, c. e. Refinery at Virgin City, Utah. Operates part time.

Diamond Refining Co., Overton, Tex. John C. Calhoun, pres. and g. m.; Joe Butler, sec.; George P. Mann, supt. Refinery at Overton, Tex.

Dixon Creek Oil & Refining Co., Amarillo, Tex. S. D. McIlroy, pres.; W. W. McIlroy, T. G. Nichols, v. p.; George W. Pennington, sec. and treas.; H. F. Allspaugh, g. m.; C. A. Hunter, gen. supt. of ref.; C. A. Hunter, supt., Kings Mill, Tex.; J. A. Harris, s. m. (tank car); W. E. Shores, c. c.; George H. McGrath, p. a. Refinery located at Kings Mill, Tex.

E

Eason Oil Co., Bass Bldg., Enid, Okla. T. T. Eason, pres. and g. m.; L. D. Hinman, v. p.; T. W. Eason, sec. and treas.; P. S. Maranville, supt., Enid, Okla.; R. H. Rowland, s. m. (tank car); J. D. Montgomery, s. m. (bulk stations); G. B. Lyon, c. c.; A. C. Hatton, p. a. Refinery located at Enid, Okla.

East Texas Refining Co., 1405 Tower Petroleum Bldg., Dallas, Tex. F. W. Burford, pres. and g. m.; John J. Thomas, v. p. and gen. supt. of ref.; R. E. Bishop, sec.; E. V. Campbell, treas.; E. L. Rogers, supt., Longview, Tex.; C. N. Watts, supt., Henderson (Friars Switch), Tex.; L. R. Brammer, s. m. (tank car); A. C. Sturgis, c. c.; W. M. Bisett, p. a. Refineries located at Henderson (Friars Switch), Tex., and Longview, Tex.

Eclipse Oil & Refining Co., Newcastle, Wyo. B. V. Hole, Jr., owner. Refinery located at Newcastle, Wyo.

Edington Wiltz Refining Co., Ltd., 570 Subway Terminal Bldg., Los Angeles, Calif. C. B. Edington, pres., g. m. and treas.; A. C. Edington, sec.; L. A. Foulger, gen. supt., Long Beach, Calif. (2800 Cherry Ave.); C. B. Edington, s. m. (tank car); T. A. Rathvon, c. c.; C. B. or A. C. Edington, p. a. Refinery at Long Beach, Calif.

Eldorado Refining Co., Eldorado, Kans. Chas. G. Yankey, pres.; Robert H. Hazlett, v. p.; T. A. Helling, sec. and g. m.; Robert H. Bradford, treas.; G. C. Anderson, gen. supt. of ref.; C. W. Rice, s. m. (tank car and bulk station); C. M. Boone, c. c.; O. G. Jackson, p. a. Refinery located at Eldorado, Kans.

Elk Refining Co., Charleston, W. Va. H. A. Logan, pres. and g. m.; F. G. Bannerot, v. p. and treas.; V. B. Ward, sec. Refinery at Falling Rock, W. Va.

Empire Oil & Refining Co., Bartlesville, Okla. H. L. Doherty, pres.; Frank R. Coates, H. R. Straight, H. D. Fruehauff, A. W. Ambrose, W. A. Jones, v. p.; C. E. Murray, sec.; R. L. Morton, Jr., treas.; P. M. Miskell, g. m.; H. W. Camp, gen. supt. of ref.; Edward H. Roy, supt., East Chicago, Ind.; Curtis E. Bailey, supt., Gainesville, Tex.; Don V. Eells, supt., Okmulgee, Okla.; Robert R. Mills, supt., Ponca City, Okla.; O. J. Tuttle, s. m. (tank car); C. A. Willis, s. m. (bulk stations); Clay Briggs, c. e.; W. W. Scheumann, c. c.; G. A. Thompson, p. a. Refineries located at Okmulgee, Okla.; Ponca City, Okla.; Gainesville, Tex.; Cushing, Okla. (shut down); East Chicago, Ind. This company is a subsidiary of Cities Service Co., New York, N. Y.

Estado Petroleum Corp., Ltd., 1315 East Hill St., Long Beach, Calif. L. Y. Mattes, pres. and g. m.; E. E. Greiner, v. p. and gen. supt. of ref.; H. Hartsock, sec. and treas.; L. Y. Mattes, s. m. (tank car and bulk stations); Stanley Blocker, c. c. Refinery at Long Beach, Calif.

Exchange Petroleum Corp., P. O. Box 817, Albany, Tex. A. A. Spencer, pres., g. m. and s. m. (tank car); Walter Nelson, Jr., v. p.; H. A. Spencer, sec. and treas.; C. C. White, supt., E. J. White, asst. supt., Albany, Tex.; Delmar Davis, s. m. (bulk stations); C. C. White, p. a. Refinery located at Albany, Tex.

Exeter Oil Co., Ltd., 1022 Board of Trade Bldg., Los Angeles, Calif. C. J. von Bibra, pres.; W. R. Cowan, v. p. and g. m.; Earle F. Demond, sec. and treas.; N. F. Gallucci, supt., Long Beach (near Hynes), Calif.; Earle F. Demond, s. m. (tank car and bulk stations). Refinery at Long Beach, Calif.

F

Falls Refining Co., Wichita Falls, Tex. James E. Parker, pres.; H. T. Parker, v. p.; H. W. Roberts, sec. and treas. Refinery located at Wichita Falls, Tex.

Franklin Creek Refining Corp., 88 Lexington Ave., New York, N. Y. Dr. F. Sonneborn, pres.; J. F. Roten, v. p.; R. G. Sonneborn, sec.; Max Pick, treas.; C. H. Alsberg, g. m.; C. E. McElhiney, supt.; C. H. Goss, asst. supt., Franklin, Pa.; C. H. Alsberg, s. m. (tank car); Dr. F. W. Breth, c. e.; C. H. Alsberg, p. a. Refinery located at Franklin, Pa.

Freedom Oil Works Co., Freedom, Pa. Earle M. Craig, pres.; Albert B. Craig, v. p.; C. E. McKee, sec. and treas.; E. J. Bischoffberger, g. m.; B. L. Heath, gen. supt. of ref; B. L. Heath, supt., Coraopolis and Freedom, Pa.; R. B. McKee, s. m. (tank car); E. N. McDonald, s. m. (bulk stations); E. L. Way, c. c.; G. J. Mohr, p. a. Refineries located at Coraopolis and Freedom, Pa.

G

Garber Refinery, Inc., Garber, Okla. C. E. Pierce, pres.; Roy R. Ayers, v. p. and g. m.; Stanley D. Letcher, sec. and treas.; H. L. Welton, gen. supt. of ref.; H. L. Welton, supt., H. B. Myers, asst. supt., Garber, Okla.; H. L. Welton, p. a. Refinery located at Garber, Okla.

General Petroleum Corp. of California, Higgins Bldg., Los Angeles, Calif. J. A. Brown, pres.; S. J. Dickey, R. A. Sperry, R. E. Maynard, W. L. McLaine, E. R. Rich, v. p.; D. W. Woods, sec.; F. C. Adams, treas. Refineries at Vernon, Los Angeles, Torrance and Lebec, Calif.

Gillette Refining Co., Gillette, Wyo. George E. Kiesling, pres., g. m. and p. a.; John W. Selby, v. p.; L. M. Kiesling, sec. and treas.; John W. Selby, supt., Gillette, Wyo.; George E. Kiesling, s. m. (bulk stations). Refinery located at Gillette, Wyo.

Gilmore Oil Co., Ltd., 2423 East Twenty-eighth St., Los Angeles, Calif. E. B. Gilmore, pres.; C. S. Beesemyer, v. p., treas. and g. m.; S. M. Salisbur, v. p. and sec.; H. L. Eggleston, gen. supt. of refs., Los Angeles; Scott Beach, supt., Los Angeles; Perry Vandervort, supt., Orcutt, Calif.; J. L. Coates, s. m. (tank car); B. A. Rowell, s. m. (bulk stations); R. H. Pierson, c. c. Refineries at Los Angeles (two) and Orcutt, Calif.

Gladetex Refining Co., Gladewater, Tex. H. L. Lockhart, pres. and g. m.; W. K. Campbell, v. p.; R. V. Nabers, sec. and treas.; O. E. Biglow, supt.; R. V. Nabers, s. m. (bulk stations); H. L. Lockhart, p. a. Refinery located at Gladewater, Tex.

Gladewater Refining Co., Gladewater, Tex. George W. Ames, mgr.

Glasgow Oil & Refining Co., Glasgow, Ky. R. B. Tyler, pres.; Sewell C. Harlin, sec. treas. and g. m.; M. R. Rippy, supt., Glasgow, Ky.; J. R. Richey, s. m. (bulk stations). Refinery located at Glasgow, Ky.

Globe Oil & Refining Co., Box 820, Blackwell, Okla. I. A. O'Shaughnessy, pres.; F. L. Jehle, v. p., g. m. and p. a.; R. E. Everitt, sec.; E. A. Lentz, treas.; O. D. Gurley, gen. supt. of ref.; A. E. Landsittel, s. m. (tank car); Charles Riney, c. e.; R. D. McCrum, c. c. Refineries located at Blackwell, Okla., and Lemont, Ill.

Golden Rule Refining Co., Wichita, Kans. Elbert S. Rule, pres. and g. m.; W. C. Long, sec. and treas.; James McIntyre, asst. supt., Wichita, Kans.; W. C. Long, s. m. (tank car and bulk stations) and p. a. Refinery located at Wichita, Kans.

Golden West Oil Co., 1507 Mills Tower, San Francisco, Calif. Richard Detert, pres.; W. E. Olmstead, v. p. and g. m.; Harry Corvin, sec. and treas.; J. F. Ryan, gen. supt. of ref.; J. F. Ryan, supt., and Bert Pope, Jr., asst. supt., Hondo, Tex.; C. B. Fulton, s. m. (tank car and bulk stations); J. E. Connevey, c. e. and c. c.; W. H. Olmstead, p. a. Refinery located at Hondo, Tex.

Goshen Oil Refining Co., Torrington, Wyo. M. A. Eaton, pres., g. m., s. m. (tank car and bulk stations) and c. c.; S. J. Eaton, v. p.; Irene Eaton, sec. and treas.; E. D. Bishop, gen. supt. of ref.; E. D. Bishop, supt., Torrington, Wyo.; E. D. Bishop, c. e. Refinery located at Torrington, Wyo.

Grayburg Oil Co., Smith-Young Tower, San Antonio, Tex. Frank E. Kistler, pres.; Charles F. Carnine, v. p.; E. H. Center, sec.; Arthur D. Kohler, treas.; Frank Hovell, supt., John Bell, asst. supt., San Antonio, Tex.; Charles Barsun, s. m. (tank car); Stanley LaRose, s. m. (bulk stations); J. W. Sweeney, p. a. Refinery located at San Antonio, Tex.

Great West Refining Co., Wichita Falls, Tex. Reece S. Allen, pres.; H. E. Clark, v. p.; Gordon T. West, sec., treas. and g. m.; J. C. Hinds, supt., V. E. Smith, asst. supt., Big Spring, Tex.; R. C. Cocanower, s. m. (tank car); J. C. Hinds, p. a. Refinery located at Big Spring, Tex.

Greenville Refining Co., Inc., Greenville, Ky. W. C. Malone, pres.; H. E. Eaves, Sr., v. p.; G. L. Hill, sec. and treas.; O. R. Sellers, supt., B. Fortenberry, asst. supt., near Greenville, Ky.; O. R. Sellers, s. m. (bulk stations); O. R. Sellers, p. a. Refinery located near Greenville (Muhlenberg County), Ky.

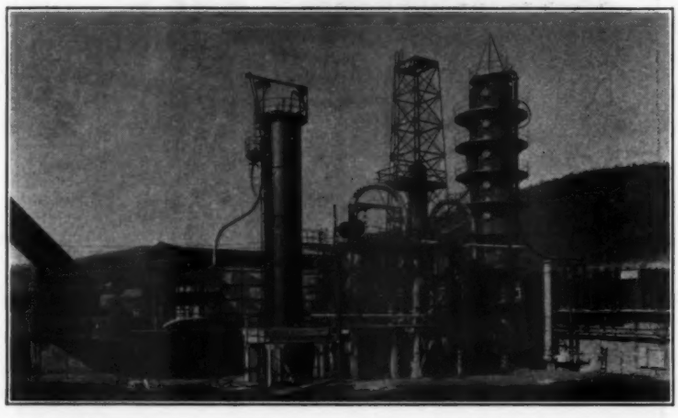
Gulf Refining Co., Frick Bldg. Annex, Pittsburgh, Pa. G. R. Nutty, pres.; Charles B. Buerger, W. V. Hartmann, J. W. Williams, H. A. Gidney, v. p.; W. J. Guthrie, sec.; J. E. Nelson, treas.; George L. Prichard, g. m. of ref.; William A. Slater, supt., W. M. Crockett, asst. supt., Port Arthur, Tex.; Herman Taylor, supt., Fort Worth, Tex.; R. M. Landon, supt., Sweetwater, Tex.; M. J. Ball, supt., J. H. Wackenhut, asst. supt., Pittsburgh, Pa.; J. V. Baney, supt., Philadelphia, Pa.; B. H. Barnes, supt., Thomas F. Hogan, asst. supt., Toledo, Ohio; E. K. Hiles, supt., Bayonne, N. J.; Thomas J. Twomey, supt., John W. Schriever, asst. supt., Cincinnati, Ohio; Herbert Henderson, m. constr. div.; H. G. Smith, m. of ref. technology; C. T. Marsh, p. a. Refineries located at Port Arthur, Tex.; Fort Worth, Tex.; Sweetwater, Tex.; Philadelphia, Pa.; Bayonne, N. J.; Pittsburgh, Pa.; Toledo, Ohio; Cincinnati, Ohio.

Gupeco Refining Co., Inc., Alexandria, La. T. L. Guillory, pres. and g. m.; Mrs. L. C. Swope, first v. p. and Mrs. C. Paschall, second v. p.; B. M. Guillory, sec. and treas.; T. L. Guillory, supt.; B. M. Guillory, asst. supt., Alexandria, La. Refinery located at Alexandria, La.

H

Hancock Oil Co. of California, Security Bldg., Long Beach, Calif. Will J. Reid, pres. and g. m.; George D. Williams, v. p. and gen. supt.; W. W. Regan, sec.; G. P. Deane, treas.; H. D. Tupper, supt., Long Beach, Calif.; C. B. Limbocker, s. m. (tank car and bulk stations); W. I. Hancock, c. e.; La Verne Smith, c. c.; W. Westergard, p. a. Refinery at Long Beach, Calif.

MODERN CRACKING INSTALLATION



Full flashing Dubbs type cracking unit erected at the Oil City, Pa., refinery of the Pennzoil Co. Plant was built by the Arthur G. McKee Co.

Personnel of Operating Refineries in United States

Hercules Gasoline Co., Ltd., 2411 East Thirtieth St., Los Angeles, Calif. E. L. Pauley, receiver in equity. (All operations have been closed down.) Refinery at Los Angeles, California. Shut down.

Holly Oil Co., Golden Cycle Bldg., Colorado Springs, Colo. Wiley Blair, Jr., pres.; L. G. Carlton, C. A. Johnson, v. p.; R. J. Garritson, sec. and treas.; C. A. Johnson, g. m.; J. H. Grimes, supt., Huntington Beach, Calif.; C. A. Johnson, s. m. (tank car); H. Tannenbaum, p. a. Refinery (shut down) located at Huntington Beach, Calif.

Houston Oil Co. of Texas, Petroleum Bldg., Houston, Tex. E. H. Buckner, pres.; L. S. Zimmerman, v. p. and treas.; A. H. Kennerly, sec.; A. W. Standing, g. m.; R. R. Hobson, gen. supt. of ref. (Camden, Ark.); F. Y. Hutchison, gen. supt. of ref. (Viola, Tex.); G. H. Hartung, supt., Camden, Ark.; W. R. Hounsell, supt., Viola, Tex.; L. H. Sexton, s. m. (tank car and bulk stations); F. Y. Hutchison, c. e.; W. R. Hounsell, c. c.; M. L. Clark, p. a. Refineries located at Camden, Ark., and Viola, Tex.

Howard County Refining Co., Big Spring, Tex. Robert T. Piner, pres.; J. E. Bristow, v. p.; Joseph Edwards, g. m., s. m. (tank car) and p. a.; G. H. Hayward, sec. and treas.; W. M. Paul, supt., Big Spring, Tex.; Henry Edwards, s. m. (bulk stations). Refinery located at Big Spring, Tex.

Humble Oil & Refining Co., Humble Bldg., Houston, Tex. W. S. Farish, pres.; H. C. Weiss, R. L. Blaffer, E. P. Sterling, James Anderson, W. W. Fondren, J. S. Bonner, v. p.; F. O. Freese, sec.; R. L. Blaffer, treas.; J. L. Finley, gen. m. of refs.; F. N. Reed, supt., W. R. Brison, M. L. Snyder, A. C. Kraft and C. E. Carlson, asst. supts., Baytown, Tex.; G. L. Farned, supt., G. P. Curtin, asst. supt., Ingleside, Tex.; C. M. Bell, supt., San Antonio, Tex.; W. H. Barber, supt., McCamey, Tex.; C. M. Dennison, supt., Chilton, Tex.; R. X. Cook, supt., Neches, Tex.; B. H. Brown, s. m. (tank car); R. B. White, s. m. (bulk stations); Dr. E. Voss, ref. eng.; W. W. Scott, prod. eng.; S. P. Coleman, c. c.; J. M. Sitler, p. a. Refineries located at Ingleside, Baytown, San Antonio, McCamey, Chilton, Neches and Breckenridge, Tex.

I

Illinois Oil Co., S. Twenty-fourth and Fourth Ave., Rock Island, Ill. Frank P. Welch, pres. and g. m.; J. W. Armstrong, v. p.; F. R. Edwards, sec. and treas.; P. J. Glover, gen. supt. of ref.; William Kelley, supt., Cushing, Okla.; Edward Donnelly, s. m. (tank car); John Ready, s. m. (bulk stations); J. W. Armstrong, c. e.; Doctor Hartman, c. c. Refinery located at Cushing, Okla. (shut down).

Indian Refining Co., 1 Havoline St., Lawrenceville, Ill. R. C. Holmes, pres.; P. C. Scullin, W. S. S. Rogers, F. T. Manley, S. B. Wright, v. p.; E. M. Crone, sec.; C. E. Woodbridge, treas.; P. C. Scullin, g. m.; J. S. Worden, supt., and S. W. Johnson, asst. supt., at Lawrenceville, Ill.; S. B. Wright, s. m. (tank car and bulk stations); A. F. Colling, p. a. Refinery at Lawrence, Ill. This company is a subsidiary of The Texas Company, New York, N. Y.

Iowa Park Producing & Refining Co., Iowa Park, Tex. J. F. Boyd., pres.; W. H. Morgan, v. p. and g. m.; J. A. Tanner, sec.-treas.; C. V. Cocke, asst. sec. Refinery at Iowa Park, Tex.; shut down.

J

Jenson Oil Refining Co., 825 McIntyre Bldg., Salt Lake City, Utah. J. B. Jenson, pres. and g. m.; D. O. Jackson, v. p.; Irman M. Jenson, sec. and treas.; W. G. Stearns, supt.; Ira Packard, asst. supt.; C. R. Bostwick, s. m. (tank car and stations). Company has small refinery at Salt Lake City which it expects to enlarge during 1932.

Johnson Oil Refining Co., 175 West Adams St., Chicago, Ill. I. H. Johnson, pres. and g. m.; L. Ralph Johnson, v. p. and g. m. of ref.; James J. Johnson, c. of b.; G. C. Lilly, sec. and treas.; W. J. Leenhouts, supt., R. B. Fowler, asst. supt., Cleveland, Okla.; H. G. Plane, s. m. (tank car); I. H. Johnson and J. J. Johnson, s. m. (bulk stations); A. L. Olson, p. a. Refinery located at Cleveland, Okla.

Joplin Refining Co., P. O. Box 866, Joplin, Mo. A. E. Basinger, pres. and g. m.; W. F. Maher, v. p., sec. and treas.; C. S. Banks, gen. supt. of ref.; George J. Young, s. m. (tank car and bulk stations); C. S. Banks, p. a. Refinery located at Joplin, Mo.

K

Kanotex Refining Co., Arkansas City, Kans. C. M. Boggs, pres.; W. L. Lesh, v. p.; E. K. Childers, sec.; R. R. Cox, treas.; F. A. Deering, supt., Charles Wakefield, asst. supt., Arkansas City, Kans.; Guy L. Kirk, research chem. Refinery located at Arkansas City, Kans.

Kendall Refining Co., Bradford, Pa. Otto Koch, pres. and g. m.; Joseph H. Bovaird, H. H. Greene, v. p.; H. H. Greene, sec.; I. H. Shearer, treas.; E. E. Bown, m. of ref.; J. B. Fisher, s. m. (tank car and bulk stations); S. M. Wolbert, c. e.; Frank Philippbar, c. c.; J. B. Fisher, p. a. Refinery located at Bradford, Pa.

Kent Refining Co., Box 388, Corsicana, Tex. (Individual ownership); C. A. Middleton, g. m. and s. m. (tank car). Refineries located at Angus and Minerva, Tex. Both plants temporarily shut down in March.

Kettle Creek Refining Co., El Dorado, Ark. W. B. Hassett, pres., treas. and g. m.; S. H. Fredericks, v. p.; W. E. N. Phillips, sec.; J. F. Reardon, supt., El Dorado, Ark.; H. E. Ericson, s. m. (tank car); W. E. N. Phillips, p. a. Refinery located at Clayton, Mo.

Kettleman Hills Gasoline Co., Box 625, Hanford, Calif. H. H. Bell, pres.; William Gibson, v. p., treas. and p. a. Refinery located at Hanford, Calif.

Kilgore Refining Co., Kilgore, Tex. Same ownership and management as Overton Refining Co., at Overton. See Overton company.

L

Lake View Oil & Refining Co., 1007 Edwards & Wildey Bldg., Los Angeles, Calif. (Receivership). Paul J. Hisey, receiver; A. J. Rehwold, v. p.; Paul J. Hisey, sec.; C. F. Powers, treas. Refinery located at Maricopa, Calif.

Lincoln Oil Refining Co., Robinson, Ill. H. B. Carpenter, pres. and g. m.; C. L. Fleming, R. E. Luton, v. p.; E. B. Redpath, sec.; F. A. Billstone, treas.; R. E. Luton, supt.; N. T. Stover, s. m. (tank car); O. P. Epler, s. m. (bulk stations); T. W. Culmer, c. c. Refinery at Robinson, Ill.

Lion Oil Refining Co., Exchange Bldg., El Dorado, Ark. T. H. Barton, pres.; T. M. Martin, M. E. Wilson, v. p.; R. E. Meinert, sec.; T. H. Barton, treas.; J. J. Allinson, ref. mgr.; J. B. Rogerson, supt., El Dorado, Ark.; T. M. Martin, s. m. (tank car); A. F. Reed, s. m. (bulk station); W. M. Carney, c. e.; R. E. Meinert, p. a. Refinery at El Dorado, Ark.

Louisiana Oil Refining Corp., Shreveport, La. Henry L. Doherty, pres.; D. W. Harris, H. R. Dickerson, W. A. Jones, T. I. Carter, v. p.; E. N. Watkins, sec.; B. R. Muirhead, treas.; D. W. Harris, g. m.; C. M. Lamason, mgr. of ref.; R. T. Pierce, supt.; J. A. O'Neill, plant supt., Bossier City, La.; R. B. Pierce, supt., W. F. Dickerson, plant supt., Gas Center, La.; C. M. Lamason, s. m. (tank car); J. A. Welch, s. m. (bulk station); J. F. Mercer, c. e.; A. W. Trusty, c. c.; W. D. Martin, p. a. Refineries located at Bossier City, La., and Gas Center, La. This company is a subsidiary of the Arkansas Natural Gas Corp. of the Cities Service Co., New York, N. Y.

Louisville Refining Co., Inc., 52 U. S. Trust Bldg., Louisville, Ky. W. S. Dudley, pres.; Eli H. Brown, Jr., J. Fred Miles, v. p. and g. m.; H. R. Smith, sec. and treas.; J. J. Loudermill, asst. supt., Louisville, Ky.; H. R. Smith, s. m. (tank car); E. S. Handley, c. e.; J. R. Currey, c. c.; W. A. Maples, p. a. Refinery located at Louisville, Ky.

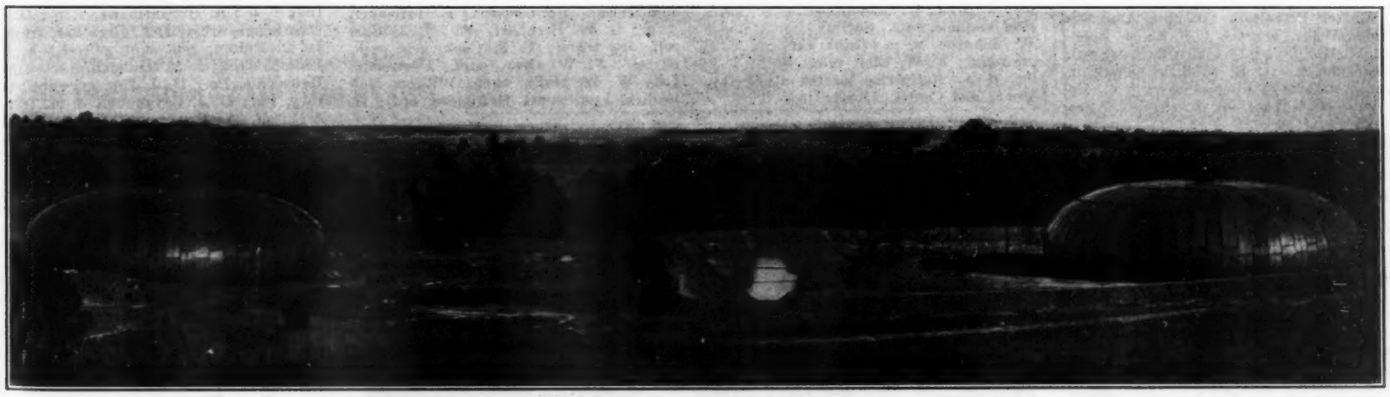
Lubrite Refining Corp., 3504 Washington Ave., St. Louis, Mo. H. T. Ashton, pres. and g. m.; W. H. Ware v. p.; P. J. Buttles, sec.; G. C. Goller, treas.; D. A. Windsor, mgr. of ref.; C. P. Bettman, supt., J. B. Hickey, asst. supt., at East St. Louis, Ill.; E. Whatley, s. m. (tank car); R. A. Frevert, c. e.; L. T. Doiron, c. c.; J. H. MacCrea, p. a. Refinery at East St. Louis, Ill. This company is a subsidiary of Vacuum Oil Co., Inc., New York.

Mc

M. M. McCallen Refining Co. R. C. Gillis and R. S. Macmillan, receivers; M. M. McCallen, pres. Refinery located at Huntington Beach, Calif.

McColl Frontenac Oil Co., Ltd., 307 Royal Bank Bldg., Montreal, Ontario. John Irwin, pres.; Fred Hunt. sec. and treas. Refineries located at Montreal and Toronto.

INSTALL NEW TYPE TANKAGE AT EAST TEXAS REFINERY



The East Texas Refining Co. recently completed two 80,000-bbl. Hortonspheroids at its Longview, Tex., refinery. These spheroids have been in service since the latter part of January and have, thus far, functioned as anticipated by the designers. The tanks were installed by the Chicago Bridge & Iron Works.

In as much as the stresses in a spheroid, due to double curvature, are much less than in a cylindrical tank, these spheroids were largely built of three-sixteenths-inch material, the unit stresses or factor of safety being more conservative than is generally used in oil tank construction. These spheroids were completely welded in the field with no preliminary shop fabrication.

The basic reason for containers built in spheroidal form lies in the fact that this form requires the least amount of material per unit of volume; furthermore, the amount of material required constantly decreases as the size increases. This is not the case with a cylindrical tank. Theoretically the amount of material per barrel stored is constant, and the economics of larger sizes occur through somewhat less labor cost and in the reduction of auxiliary items. The spheroid has these same advantages, as well as a definite reduction in the material used.

Depending upon the size, a spheroid of thin material will withstand an internal pressure; thus the spheroids illustrated—of 80,000-bbl. capacity—will withstand 1 pound pressure, and as the size goes down, the allowable pressure may be increased. Even 1 pound pressure greatly diminishes evaporation losses and thereby maintains the quality of the product stored.

An interesting fact pertaining to the design of these spheroids is that had it been desired to make them, say of 1,000,000 or 10,000,000-bbl. capacity, the outline to which they are built would scarcely change. The height would remain constant and the diameter only would increase. They would probably solve the problem of reservoirs, should large units of storage be under contemplation, in a more economical manner than concrete construction heretofore used.

The builders believe that tanks of spheroidal form will, for the general reasons cited, be much in vogue as time advances.

Personnel of Operating Refineries in United States

M

Macmillan Petroleum Corp., 530 West Sixth St., Los Angeles, Calif. R. S. Macmillan, pres.; M. P. Macmillan, H. R. Macmillan, H. E. Boner and S. M. Batterson, v. p.; DeWitt Knox, sec. and treas.; H. E. Boner, gen. supt. of refs.; C. C. Benz, supt., Long Beach, Calif.; W. F. Cereghino, supt., Borger, Tex.; L. L. Rebber, supt., El Dorado, Ark.; Elmer Clark, s. m., El Dorado; S. M. Batterson, s. m. (bulk stations); S. E. Campbell, c. e.; C. C. Benz, p. a. Refineries at Long Beach, Calif., Borger, Tex., and El Dorado, Ark. R. S. Macmillan and R. C. Gillis, appointed receivers in equity, October, 1931.

Magnolia Petroleum Co., P. O. Box 900, Dallas, Tex. E. R. Brown, pres.; B. H. Stephens, D. A. Little, W. C. Proctor, E. E. Plumly, W. H. Francis, Ralph H. Kinsloe, v. p.; B. H. Stephens, g. m.; D. A. Little, asst. g. m.; W. C. Proctor, treas. and asst. sec.; Courtenay Marshall, sec. and asst. treas.; E. E. Plumly, m. of ref.; C. S. Dickens, supt., J. W. Newton and G. E. Plumly, asst. supt., Beaumont, Tex.; W. W. White, supt., Magpetco, Tex.; John Ricker, supt., C. J. Lockwood, asst. supt., Fort Worth plant No. 1; Eugene Ritter, supt., Fort Worth plant No. 2; W. C. Ralston, supt., Corsicana; J. T. Dickens, supt., N. B. Marchbanks, asst. supt., Luling; E. P. Angus, s. m. (bulk stations); R. G. Sanders, c. e.; W. W. Leach, c. c.; J. P. David, p. a. Refineries located at Beaumont, Magpetco, Corsicana, Luling and two plants at Fort Worth, Tex.

Malco Refineries, Inc., Artesia, N. Mex. M. E. Barsh, pres. and g. m.; Lloyd R. Simon, v. p.; Ralph A. Shugart, sec. and treas.; Lloyd R. Simon, gen. supt. of ref.; R. L. Halley, s. m. (tank car and bulk stations); W. J. Haskins, c. e. Refinery located at Artesia, N. Mex.

Marathon Oil Co., Box 2064, Tulsa, Okla. W. W. Fleming, pres.; T. B. McCammon, v. p.; J. L. Cook, sec. and treas.; A. J. Slagter, gen. supt. of ref.; W. R. Sonricker, supt.; H. L. Meegan, asst. supt., Fort Worth, Tex.; D. L. Winsett, supt., Del Rio, Tex.; J. R. Barrott, supt., J. Turvey, asst. supt., Bristow, Okla.; T. L. Miller, supt., Boynton, Okla.; J. V. McCormick, s. m. (tank car); H. J. Scott, s. m. (bulk stations); W. R. Brown, p. a. Refineries located at Fort Worth, Tex.; Del Rio, Tex.; Bristow, Okla.; Boynton, Okla. This company is a subsidiary of Ohio Oil Co., Findlay, Ohio.

Master Petroleum Co., 401 Amecabco Bldg., Waco, Tex. S. J. S. Smith, pres.; R. V. McClain, v. p.; Floyd Casey, sec., treas and g. m.; R. L. Slastrunk, s. m. (bulk stations); Floyd Casey, p. a. Refinery located at 500 Peach St., Waco, Tex.

Mentone Oil & Refining Co., Mentone, Tex. Owned by H. C. Chaddick and E. T. Barker, Jr., partners. Refinery located at Arno, Tex.

Mid-Continent Petroleum Corp., Cosden Bldg., Tulsa, Okla. Jacob France, pres.; J. C. Denton, F. B. Koontz, R. W. McDowell, G. O. Moody, v. p.; E. M. Rouzer, sec.; Charles Klein, treas.; F. B. Koontz, v. p. in charge of mfg.; D. G. Morgan, asst. supt., Tulsa, Okla.; R. W. McDowell, v. p. in charge of sales; H. T. Bennett, c. e.; C. A. Prichard, p. a. Refinery located at Tulsa, Okla.

Midland Oil Refining Co., 315 Midland Savings Bldg., Denver, Colo. L. M. Hines, pres. and g. m.; W. T. Hostetter, v. p.; Perry Brooks, sec.; Ira C. Baugh, treas.; F. W. Palis, gen. supt. of ref.; F. W. Palis, supt., Osage, Wyo.; M. B. Johnson, s. m. (bulk stations); Arthur W. Simpkins, c. e.; J. Fred Foley, p. a. Refinery located at Osage, Wyo.

Midwest Refining Co., First National Bank Bldg., Denver, Colo. Thomas A. Dines, pres.; H. G. Naylor, H. C. Bretschneider, G. H. Jaques, v. p.; L. G. Truby, sec.; W. L. Greiner, treas.; J. E. Rouse, g. m.; A. E. Thompson, supt., R. E. Beard, asst. supt., Casper, Wyo.; B. L. Warren, supt., Greybull, Wyo.; J. F. Cullen, supt., Laramie, Wyo.; P. F. Weidner, c. e.; S. H. Digges, c. e.; A. G. Fidel, p. a. Refineries located at Casper, Greybull and Laramie, Wyo. This company is a subsidiary of the Standard Oil Co. (Indiana) and all refineries are operated by manufacturing department of the parent company.

A. D. Miller Sons Co., 1801 Preble Ave., Pittsburgh, Pa. J. B. Miller, pres., g. m. and gen. supt. of ref.; A. D. Miller, III., v. p. and treas.; O. B. Opsion, sec. and supt.; William Clowes, asst. supt., Pittsburgh, Pa.; J. B. Miller, s. m. and O. B. Opsion, asst. s. m. (tank car and bulk stations); William Clowes, c. e.; J. B. Miller, c. e. and p. a. Refinery located at Pittsburgh, Pa.

Misko Refineries, Inc., Laredo, Tex. O. W. Killam, pres.; W. T. Killam, Kent W. Bartlett, v. p. and g. m.; J. O. Garnett, sec.; W. T. Killam, treas.; G. W. Estes, gen. supt. of ref.; G. W. Estes, supt., Mirando City, Tex.; Kent W. Bartlett, s. m. (tank car); C. T. Nunn, c. c.; Kent W. Bartlett, p. a. Refinery located at Mirando City, Tex.

Monarch Refineries, 820 Delwiler Bldg., Los Angeles, Calif. Charles W. Fourl, pres. and g. m.; W. J. Williams, v. p.; L. A. Wagner, sec.; Frank McGee, gen. supt. of ref. Refinery located at Venice-Playa Del Rey, Calif.

Mountain States Refining Co., Orchard, Colo. E. A. Calkins of Fort Morgan, Colo., pres.; A. E. Shogren, v. p.; S. D. Markley, sec.; E. G. Markley, treas.; C. A. Stewart, supt. Refinery located at Orchard, Colo.

Muenster Refining Co., Drawer G, Muenster, Tex. (Individual ownership, no officers.) A. G. Hutton, owner and supt. Refinery located at Muenster, Tex.

N

National Refining Co., 1404 East Ninth St., Cleveland, Ohio. Frank B. Fretter, pres. C. S. Smith, W. H. Lamprecht, v. p.; J. D. Sadler, sec.; H. F. Heil, treas. and v. p. Refineries located at Coffeyville, Kans.; Findlay, Ohio, and Marietta, Ohio.

Naph-Sol Refining Co., Muskegon, Mich. W. E. Anderson, pres.; J. F. Helms, v. p.; A. W. Perry, sec. and treas.; J. F. Helms, gen. supt. of ref.; A. F. Hickey, s. m. (tank car and bulk stations); C. S. Walker, p. a. Refinery located at Muskegon, Mich.

Northwest Stellarene Co., Inc., Shelby, Mont. James W. Johnson, B. E. Heppler, v. p.; F. E. Cannon, sec. and treas.; Bud Vadnais, supt., Shelby, Mont.; James W. Johnson, s. m. (tank car and bulk stations); F. W. Eley, c. c.; G. B. Taylor, p. a. Refineries located at Shelby, Mont., and Coutts, Alberta.

Norwalk Co., 634 South Spring St., Los Angeles, Calif. L. T. Barneson, pres.; L. L. Aubert, g. m.; E. L. Tobias, plant supt. Refinery located at Maricopa, Calif.

O

Octane Oil Refining Co., Baird, Tex. Sylvester Dayson, pres. and g. m.; J. R. Parten, v. p.; J. R. Pope, sec. and treas.; J. L. LeBleu, supt., Baird (Callahan County), Texas. Refinery located at Baird, Tex.

Ohio Valley Refining Co., 201 Barkwill St., St. Marys, W. Va. J. P. Flynn, pres.; H. J. Crawford, v. p., W. R. Reitz, sec. and treas.; J. B. Northrop, supt., A. M. Kiester, asst. supt., St. Marys, W. Va.; A. M. Kiester, s. m. (tank car); H. G. Triplett, s. m. (bulk station) (Sterling Oil Co. subsidiary); G. R. Dye, c. e.; J. B. Northrop, p. a. Refinery located at St. Marys, W. Va.

Old Dutch Refining Co., Muskegon, Mich. John Borden, pres. and g. m.; John Manley, v. p.; F. H. Duggan, sec. and treas.; C. M. Ridgway, gen. supt. of ref.; E. R. Hively, asst. supt.; Clyde Cornwell, c. e.; N. Buining, p. a. Refinery located at Muskegon, Mich.

Olney Oil & Refining Co., Wichita Falls, Tex. Frank Kell, pres.; R. G. Cocanower, sec., treas. and g. m.; P. E. Slater, gen. supt. of ref.; R. G. Cocanower, s. m. (tank car). Refinery located at Olney, Tex.

Olympic Refining Co. (operated by Rio Grande). Charles P. Ritter, pres. and g. m.; P. Johnson, A. H. Schaad, v. p.; D. T. Buckley, sec. and treas. Refinery located at Long Beach and Newport, Calif.

Oriental Oil Co., 1911½ Pacific Ave., Dallas, Tex. W. R. Smith, pres.; Frank M. Smith, v. p. and g. m.; D. G. White, sec. and treas.; F. N. Williams, supt., West Dallas, Tex.; B. H. Pitman, s. m. (tank car); O. D. Martin, s. m. (bulk stations); J. D. Scruggs, c. e.; W. T. Evans, c. c.; B. H. Pitman, p. a. Refinery located at West Dallas, Dallas, Tex.

Overton Refining Co., Overton, Tex. J. D. Wrather, pres. and g. m.; G. C. Walters, sec.; John Wrather, treas. and gen. supt. of ref.; P. H. Hertzog, s. m. (tank car and bulk stations); John Wrather, c. e. and p. a. Refinery located at Overton, Tex.

P

Pan American Petroleum & Transport Co., 122 East Forty-second St., New York, N. Y. R. G. Stewart, pres.; P. H. Harwood, William Green, Harold Walker, J. S. Wood, T. S. Cooke, C. F. Hatmaker, v. p.; L. W. Bernhart, sec.; J. A. Carrell, Jr., treas.; T. S. Cook, gen. supt. of ref.; F. W. Grey, supt., Destrehan, La.; W. W. Halin, supt., William Mellendick, asst. supt., Baltimore, Md.; H. T. Halin, supt., S. B. Schapiro, asst. supt., Savannah, Ga.; C. F. Hatmaker, s. m. (tank car and bulk stations); H. A. Harley, p. a. Refineries located at Destrehan, La.; Baltimore, Md., and Savannah, Ga. This company is a subsidiary of Standard Oil Co. (Indiana), Chicago, Ill. All Pan American refineries in the United States operated under name of Mexican Petroleum Corp.

Panhandle Refining Co., Wichita Falls, Tex. Roy B. Jones, pres. and g. m.; M. A. Chambers, v. p. and treas.; R. C. Stanford, sec.; W. F. Sims, supt., O. B. Males, asst. supt., Wichita Falls, Tex.; G. W. Reed, s. m. (tank car and bulk stations); V. U. Cloer, c. e.; Roy J. Mann, p. a. Refinery located at Wichita Falls, Tex.

The Paraffine Companies, Inc., San Francisco, Calif. R. S. Shainwald, pres.; W. H. Lowe, v. p. and g. m.; R. Ohea, sec.; R. H. Shainwald, treas.; A. H. Irving, gen. supt. of ref.; O. H. Robertson, supt., Emeryville, Calif.; E. E. Robertson, asst. supt.; D. Finley, c. e.; A. H. Silverstone, p. a. Refinery located at Emeryville, Calif.

Pasotex Petroleum Co., 225 Bush St., San Francisco, Calif. K. R. Kingsbury, pres.; H. D. Collier, R. W. Hanna, A. S. Russell, v. p.; J. H. Tuttle, sec.; V. F. Palmer, treas. Refinery located at El Paso, Tex. This company is a subsidiary of Standard Oil Co. (California).

Pecos Diamond Refining Co., Artesia, N. Mex. G. A. Grober, pres., g. m. and gen. supt. of ref.; L. M. Grober, v. p.; Henry W. Herriman, sec. and treas.; J. Haskins, c. e.; G. A. Grober, p. a. Refinery located at Artesia, N. Mex.

Peninsula Oil Co., 226 East Fifth St., Port Clinton, Ohio. C. W. Underwood, pres. and g. m. George A. Becker, v. p.; R. L. Seufert, sec. and treas. Refinery located at Catawba Island, Ohio.

Pennsylvania Oil Products Refining Co., Warren, Pa. M. F. Cowden, pres.; George E. Muir, v. p.; H. E. Lawrence, sec.; D. F. Cowden, treas.; S. Stannard, supt. and c. e.; H. S. Hayden, s. m. (tank car and tank wagon).

Pennsylvania Refining Co., Butler, Pa. John A. Beck, pres.; W. K. Glenn, A. B. Weingard, v. p.; Paul R. Beck, sec. and treas.; W. W. Beck, g. m. and gen. supt. of ref.; W. W. Beck, supt., Karns City, Pa.; Adam Mosher, supt., Titusville, Pa.; M. H. Hindeman, s. m. (tank car); George Kirkwood, c. e. Refineries located at Karns City and Titusville, Pa.

The Pennzoil Co., Oil City, Pa. C. L. Suhr, pres. and g. m.; J. F. Vandeventer, first v. p.; A. S. Matthews, v. p.; D. J. Cavanaugh, sec.; M. A. Brewster, treas.; L. D. Fulton, gen. supt. of ref.; L. D. Fulton, supt., J. M. Hinman, asst. supt., Rouseville, Pa.; D. J. Harvey, supt., Oil City, Pa.; D. J. Cavanaugh, s. m. (tank car); R. A. Browne, s. m. (bulk stations); P. M. Robinson, c. c.; W. R. Birkmayr, p. a. Refineries located at Rouseville, Pa., and Oil City, Pa.

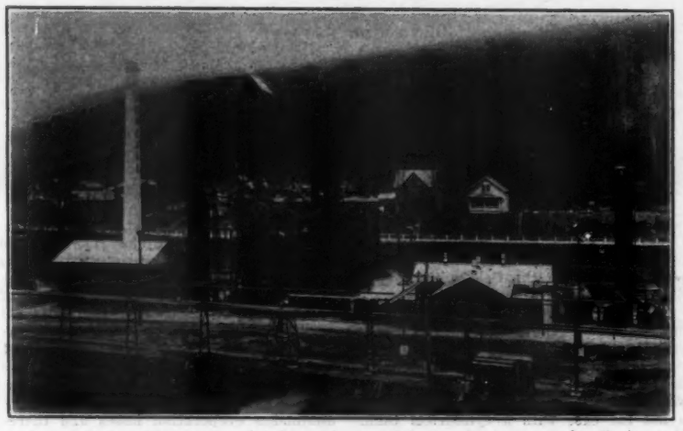
Peppers Gasoline Co., Box 858, Enid, Okla. Charles C. Peppers, pres. and g. m.; H. H. Champlin, sec.; C. R. Williamson, gen. supt. of ref. Refinery located at Covington, Okla.; shut down.

Petrol Corp., 4020 Bandini Blvd., Los Angeles, Calif. Edwin W. Pauley, pres.; James Fitzpatrick, sec.; Percy F. Cartzdafner, treas. Refineries located at Bandini (Los Angeles), Calif.

Petroleum Refractionating Corp., P. O. Box 1893, Tulsa, Okla. S. L. Lubell, pres.; Mark Finston, v. p. and g. m.; Albert Finston, sec., treas. and gen. supt. of ref.; Rex Young, supt., Grandfield, Okla.; Richard Horner, supt., Pampa, Tex.; Jesse Finston, s. m. (tank car); J. H. Naron, p. a. Refineries located at Grandfield, Okla.; Pampa, Tex.; Bodie (Longview), Tex.

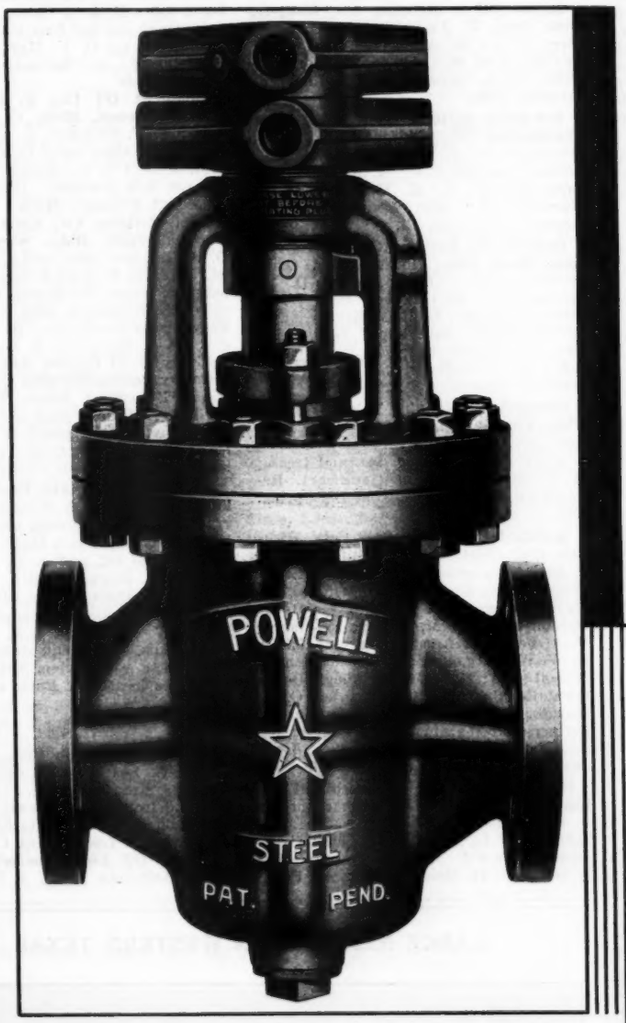
Phillips Petroleum Co., Phillips Bldg., Bartlesville, Okla. Frank Phillips, pres.; L. E. Phillips, John H. Kane, Clyde Alexander, William N. Davis, H. E. Koopman, J. S. Dewar, P. J. McIntyre, J. M. Sands, F. E. Rice, H. A. Trower, C. R. Musgrave, v. p.; O. K. Wing, sec. and treas.; Clyde Alexander, g. m.; M. P.

NEW CRACKING STILL AT PENNSYLVANIA REFINERY



View of Dubbs cracking unit recently placed in operation at Bradford, Pa., refinery of Kendall Refining Co.

The POWELL NEW *mechanical* LIFT PLUG VALVE . .



Designed for long, dependable service

•

The Powell Mechanical Lift Plug Valve—designed for high-pressure, high-temperature, and general refinery service—is ideal for handling steam, water, gas, acid, and alkali media.

Operation is very simple. An elevating screw collar lifts plug from valve body sufficiently to eliminate frictional contact between the body and plug. A rotating collar allows the plug to be moved to the desired position, after which the elevating screw collar is used to lock plug in body. Four sockets are provided in lifting and positioning screw collars. The indicator at the top of the plug stem shows the position of the valve. No wrench is required, only a small round bar is necessary to operate the valve.

THE WM. POWELL CO.
2321-31 Spring Grove Ave.
Cincinnati, Ohio

Engineering & Export Dept.
50 Church St., Room 200
New York, N. Y.

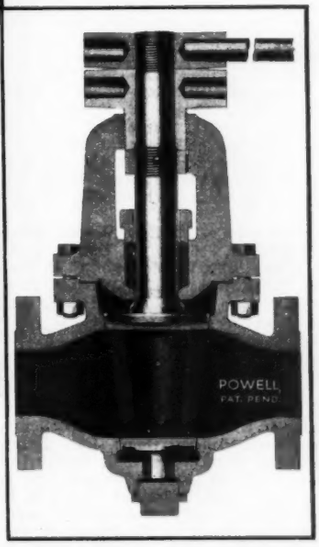
Chicago Office
E. F. Smith, Dist. Mgr.
400 N. Michigan Ave.

A full-way area is afforded through the valve. Contact surface of plug and valve body are fitted, ground and lapped positively tight.

•

No lubricant is necessary

•



These valves are obtainable in bronze, iron and steel, in straight-way, three-way, and four-way patterns, for varying pressure conditions. Sizes 1½" to 12".

Send for the bulletin describing these new plug valves.

POWELL VALVES

Personnel of Operating Refineries in United States

Youker, gen. supt. of ref.; W. G. Hiatt, asst. gen. supt. of ref.; Hugh Miller, supt., Borger, Tex.; J. W. Mitchell, supt., Kansas City, Kans.; R. D. Evans, supt., Okmulgee, Okla.; M. E. Foster, s. m. (tank car); R. C. Joplin, s. m. (bulk stations); A. H. Riney, c. e.; W. H. Creel, ref. engr.; M. B. Heine, p. a. Refineries located at Borger, Tex.; Kansas City, Kans.; Okmulgee, Okla.

Phoenix Refining Co., Inc., P. O. Box 5055, Dallas, Tex. Raymond R. Russell, pres.; Dr. Daniel Russell, v. p.; Mrs. R. R. Russell, sec.; E. E. Wallace, g. m.; J. F. Muense, supt., Dallas.; J. H. Hall, supt., Pettus; E. E. Wallace, s. m. (tank car and bulk stations); J. F. Muense, c. e.; E. E. Wallace, p. a. Refineries located at Dallas, Tex., and Pettus, Tex.

Pilgrim, Inc., Ardmore, Okla. Walter Neustadt, pres.; Max Westhermer, v. p.; D. W. Neustadt, sec. and treas. Refinery located at Kingston, Okla.

Pioneer Oil & Refining Co., 604 Caroline St., San Antonio, Tex. A. B. Slimp, pres.; M. L. Roark, sec. and treas. Refinery at Somerset, Tex.

Primrose Refining Co., Box 1455, Wichita Falls, Tex. H. D. Brinn, pres.; S. E. Brin, v. p.; E. Garonzik, sec.; H. J. Strief, treas. and g. m.; C. J. Gibbs, supt., Wichita Falls, Tex.; H. J. Strief, s. m. (tank car) and p. a. Refinery located at Wichita Falls, Tex.

Producers & Refiners Corp., Box 449, Independence, Kans. L. R. Crawford, pres.; John Fertig, v. p. and g. m.; A. W. Heinemann, sec.; O. O. Holmgren, treas.; J. A. Sartori, gen. supt. of ref. John Cutter, supt., M. H. Nolan, asst. supt., Tulsa, Okla.; L. M. Johnston, supt., and W. R. Newman, asst. supt., Parco, Wyo.; A. T. Smith, s. m. (tank car); B. L. Meece, asst. s. m.; John Blair, c. e.; Peter Vilkas, c. c., Tulsa; A. B. Lort, c. c., Parco; E. L. Chatfield, p. a., Tulsa; C. D. Wells, p. a., Parco. Refineries located at West Tulsa, Okla.; Parco, Wyo.; Blackwell, Okla. (shut down). This company is a subsidiary of the Prairie Oil & Gas Co.

Producers Oil Co., Philcade Bldg., Tulsa, Okla. George W. Snedden, pres. and g. m.; M. D. Sanford, v. p.; G. A. McCulley, sec. and treas.; J. W. Koontz, gen. supt. of ref.; I. H. Patton, Jr., s. m. (tank car and bulk station); M. D. Sanford, p. a. Refinery located at Bristow, Okla.

Pure Oil Co., 35 East Wacker Drive, Chicago, Ill. Henry M. Dawes, pres.; F. S. Heath, R. W. McIlvain, C. B. Watson, N. H. Weber, L. S. Wescoat, Rawleigh Warner, v. p.; F. S. Heath, sec.; Rawleigh Warner, treas.; C. B. Watson, v. p. in charge of ref.; E. A. McCadden, supt., John Grace, asst. supt., Marcus Hook, Pa.; J. R. Palmer, supt., J. C. Megraw, asst. supt., Cabin Creek, W. Va.; E. E. McPherson, supt., Heath, Ohio; O. B. Wendeln, supt., H. L. Smith, asst. supt., Toledo, Ohio; John Jeffry, supt., B. F. Wallace, asst. supt., Ardmore, Okla.; G. A. McBride, supt.; G. T. Yost, asst. supt., Muskogee, Okla.; R. L. Vernor, supt., and J. S. Allen, asst. supt., Nederland, Tex.; C. W. Feldmeier, and R. H. McElroy, s. m. (tank car); L. S. Wescoat, s. m. (bulk station); D. E. Sullivan, c. e.; C. R. Wagner, c. e.; G. L. Parson, p. a. Refineries located at Marcus Hook, Pa., Cabin Creek, Jct., W. Va.; Heath, Ohio; Toledo, Ohio; Ardmore, Okla.; Muskogee, Okla.; Nederland (Smith's Bluff), Tex.

Pure Penn Refining Co., Clarendon, Pa. E. H. Beshlin, pres.; H. G. Eaton, v. p.; C. D. Blair, sec. and treas.; Herbert A. Ross, g. m., supt. of ref., s. m. (tank car) and c. e.; W. J. Coloin, c. e. Refinery located at Clarendon, Pa.

Q

Ouachita Valley Refining Co., P. O. Box 610, El Dorado, Ark. John E. Shatford, pres. and g. m.; Edward V. Stockman, v. p.; E. B. Wall, sec.; C. L. Crenshaw, treas.; John E. Shatford, supt.; C. L. Crenshaw, s. m.; H. J. Shatford, c. e.; John E. Shatford, p. a. Refinery at El Dorado, Ark.

Quaker State Oil Refining Corp., Oil City, Pa. H. J. Crawford, pres.; S. Messer, J. D. Berry, v. p.; W. R. Reitz, sec.; C. D. Berry, treas.; W. H. Rockman, supt., McKean plant, Bradford, Pa.; E. E. Ebner, supt., Emlenton plant, Emlenton, Pa.; H. E. Shoemaker, supt., Independent plant, Oil City, Pa. Refineries located at Bradford, Emlenton and Oil City, Pa.

R

Raven Oil & Refining Co., Rangely, Colo. John W. Leonard, pres.; Fred G. Cary, v. p.; R. A. Bryson, sec., treas. and g. m.; M. M. Cook, supt. at Rangely, Colo.; R. A. Bryson, p. a. Refinery at Rangely, Colo.

Red River Refining Co., Inc., 77 West Washington St., Chicago, Ill. E. F. Buchanan, v. p. and treas.; John E. Schulze, sec and c. e.; R. S. Watt, gen. supt. of ref.; C. A. Harris, supt. at Burnham, Ill.; Albert Conrad, c. e. Refinery at Burnham, Ill.

Republic Oil Refining Co., Second National Bank Bldg., Houston, Tex. O. D. Robinson, pres.; J. O. Corner, D. W. Hovey, v. p.; Otto Massey, sec.; W. H. Moreland, treas.; L. M. McKinney, supt., W. H. Fraser, asst. supt., Texas City, Tex.; H. F. Hoffmaster, Jr., s. m. (tank car); F. A. Sandberg, c. e. Refinery located at Texas City, Tex.

Richardson Refining Co., Electric Bldg., Fort Worth, Tex. W. D. Richardson, pres. and g. m.; Stanley Cosden, v. p.; C. F. Dyckmans, sec. and treas.; W. D. Richardson, s. m. (tank car). Refinery (shut down) located at Big Spring, Tex.

Richfield Oil Co. of California, Richfield Bldg., Los Angeles, Calif. William C. McDuffie, receiver in equity; R. W. Walsh, J. S. Wallace, J. C. Graves, H. M. Gallagher, A. M. Kelley, v. p.; B. M. Melvin, sec.; A. M. Kelley, ref. mgr.; R. A. Panero, ref. supt., Watson, Calif.; R. W. Walsh, g. s. m.; J. C. Graves, mgr. fuel oil sales; H. D. Maxwell, mgr. (service stations); C. L. Shaffer, c. e.; C. K. Hughes, c. c.; A. W. Buchanan, p. a. Refineries at Watson, Hynes, Los Angeles and Bakersfield, Calif. All shut down except Watson plant.

Rio Grande Oil Co., 417 South Hill St., Los Angeles, Calif. L. E. Lockhart, pres.; L. M. Lockhart, C. S. Jones, A. M. Lockhart, v. p.; L. M. Lockhart, sec.; C. S. Jones, treas.; J. J. Downey, gen. supt. of refs.; D. H. Driscoll, supt., El Paso, Tex.; L. D. Frizzell, supt., Phoenix, Ariz.; William Murray, supt., Los Angeles, Calif.; J. N. Reed, s. m. (tank car and bulk stations); H. H. Kelly, p. a. Refineries located at South Gate, Calif., Phoenix, Ariz., and El Paso, Tex. South Gate and Phoenix plants shut down.

Rock Island Refining Co., Oklahoma Bank Bldg., Duncan, Okla. L. B. Simmons, pres. and g. m.; R. H. Brown, v. p.; H. P. Kerr, sec. and treas.; A. L. Rayburn, gen. supt. of ref.; A. L. Rayburn, supt., Beckett, Okla.; E. J. Glover, s. m. (tank car and bulk stations); E. M. Skinner, c. e.; C. V. May, c. c.; R. A. Boggess, p. a. Refinery located at Beckett, Okla.

Roosevelt Oil Co., P. O. Box 168, Mount Pleasant, Mich. C. L. Maguire, pres.; T. F. Caldwell, v. p. and treas.; M. E. Sheridan, sec.; C. G. Guy, gen. supt. of ref.; T. F. Caldwell, s. m. (tank car and bulk stations). Refinery located at Mount Pleasant, Mich.

Root Refining Co., 1,000 Commercial National Bank Bldg., Shreveport, La. D. P. Hamilton, pres. and g. m.; H. Canon, v. p.; T. E. Beaird, sec.; L. C. Hallonquist, treas.; Ed Kimes, supt., El Dorado; John Brown, asst. supt.; D. A. Brown, s. m. (tank car); R. T. Colquette, c. e.; O. E. Day, c. c.; T. E. Beaird, p. a. Refinery at El Dorado, Ark.

Rotary Process Refining Co., Ltd., 4731 East Fifty-second Drive., Los Angeles, Calif. J. E. Elliott, pres. and g. m.; F. C. Merritt, v. p. and treas.; H. W. Parmalee, sec.; C. A. Day, Jr., gen. supt. of refs. Refinery at Bell, Calif. Shut down.

Russell Oil Co., 642 Utah Ave., Billings, Mont. Joseph Russell, pres. and v. p.; Mrs. Anna Russell, sec. and treas.; W. J. Thomas, g. m.; Hugh H. Sargent, gen. supt. of ref. and p. a.; W. S. Duncan, supt., Butte, Mont.; John Hoen, asst. supt., Butte; Mike Hoyem, supt., Abner Kolstead, asst. supt., Billings, Mont.; W. J. Thomas, s. m. (tank car); Glenn Faus, s. m. (bulk stations); Louis Simonich, c. e.; William Negherbon, c. c. Refineries located at Butte and Billings, Mont.

S

Seaboard Petroleum Corp., 2474 East Ninth St., Los Angeles, Calif. Howard M. Miles, pres. and g. m.; C. B. Smith, v. p. and treas.; H. J. Lewis, sec.; C. A. Morehead, s. m. (bulk stations). Refinery located at Los Angeles, Calif.

Seaside Oil Co., Summerland, Calif. A. M. Heineman, pres.; J. F. Bushnell, v. p., treas, g. m. and s. m. (tank car); M. W. O'Brien, sec.; D. C. Peet, gen. supt. refs.; L. E. McCampbell, asst. supt., Ventura, Calif.; F. F. Fuller, asst. supt., Summerland, Calif.; Winslow Bushnell, s. m. (bulk stations); E. H. Beresford, p. a. Refineries at Ventura and Summerland, Calif.

Shell Oil Co., Shell Bldg., 100 Bush St., San Francisco, Calif. G. Legh-Jones, pres.; H. R. Gallagher, John Lauder, G. H. Van Senden, Dr. E. F. Davis, E. L. Miller, J. U. Stair, v. p.; A. R. Bradley, sec.; John Lauder, treas.; C. O. F. Jenkin, supt., D. M. Day, asst. supt., Martinez, Calif.; J. F. M. Taylor, supt., I. M. Hemphill, asst. supt., Wilmington, Calif.; J. F. M. Taylor, supt., A. W. Jurrissen, asst. supt., Dominguez, Calif.; C. O. F. Jenkin, supt., Coalinga, Calif.; L. T. Kittinger, s. m. (tank car and bulk stations); N. W. Thompson, c. e.; J. C. Storey, p. a. Refineries located at Wilmington, Martinez, Coalinga and Dominguez, Calif. This company is a subsidiary of Shell-Union Oil Co., New York, N. Y.

Shell Petroleum Corp., Shell Bldg., St. Louis, Mo. R. G. A. van der Woude, pres.; T. F. Lydon, Richard Airey, W. Gould, A. Fraser, Dr. W. van Hoist Pellekaan, G. S. Rollin, L. van Eeghen, Dr. F. W. L. Tydeman, v. p.; P. R. Chenoweth, sec.; T. F. Lydon, treas.; R. C. Roberts, supt., P. E. Hurley, asst. supt., Arkansas City, Kans.; Dr. R. H. Waser, supt., J. L. Miller, asst. supt., East Chicago, Ind.; R. B. High, supt., T. G. Elder, asst. supt., Houston, Tex.; P. E. Foster, supt., W. G. Horstman and H. A. Stiles, asst. supt., Norco, La.; E. H. Schippers, supt., A. R. Moorman and R. E. McCurdy, asst. supt., Wood River, Ill.; R. D. Ebbert, s. m. (tank car); F. S. Jenkins, s. m. (bulk stations); S. Peterson, c. e.; S. Tijmstra, c. c.; C. B. Singleton, p. a. Refineries located at Arkansas City, Kans.; East Chicago, Ind.; Houston, Tex.; Norco, La., and Wood River, Ill. This corporation is a subsidiary of the Shell-Union Oil Co., New York, N. Y.

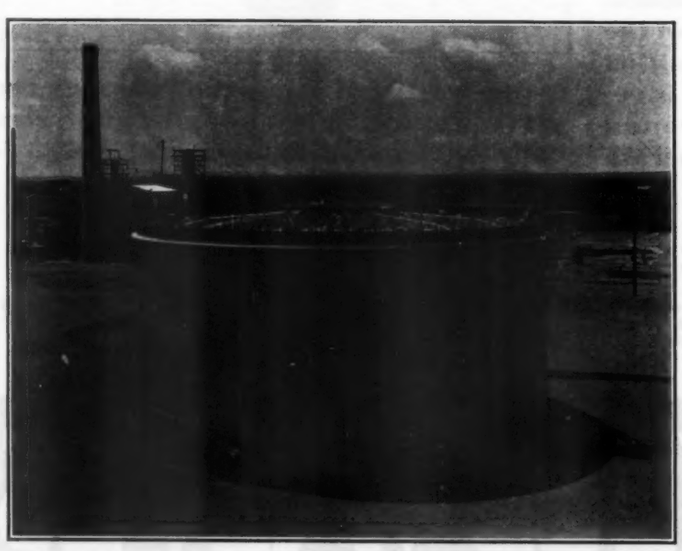
Sherwood Refining Co., Bush Terminal Bldg., Brooklyn, Tex. H. H. Sherwood, pres. and g. m.; H. H. Watkins, v. p.; James W. Jackson, sec.; G. D'Amore, treas.; Elmer Peters, supt. at Warren, Pa.; V. L. Roberson, s. m. (tank car); William F. Kroneman, s. m. (stations); Dr. R. R. Rosenbaum, c. c.; H. H. Sherwood, p. a. Company operates refinery at Warren, Pa., formerly owned by Mutual Refining Co.

Simrall Refining Corp., 511 Union Central Bldg., Cincinnati, Ohio. W. F. Simrall, pres.; R. P. Crothers, sec.; A. A. Buschle, treas.; R. P. Crothers, gen. supt. of ref.; E. H. Crawley, supt., Horse Cave, Ky.; C. G. Miller, supt., Amherstburg, Louisville, Ky.; George Stoll, s. m. (tank car). Refineries located at Horse Cave, Ky., and Amherstburg, Ontario.

Simms Oil Co., 1007 Magnolia Bldg., Dallas, Tex. Edward T. Moore, pres. and g. m.; F. R. Schneider, v. p.; L. W. Richards, sec.; D. H. Voss, treas.; I. H. Lantz, supt., Dallas, Tex.; R. C. Burns, supt., Smackover, Ark.; H. W. Coleman, asst. s. m. (tank car); George D. Bowers, s. m. (bulk stations); Frank Gardner, c. e.; H. L. Kerr, c. c.; W. J. Morrison, p. a. Refinery located at Dallas, Tex., and Smackover, Ark.

Sinclair Refining Co., 45 Nassau St., New York City. E. W. Sinclair, pres.; J. W. Carnes, M. L. Gosney, J. M. O'Day, Sheldon Clark, E. W. Isom, H. L. Phillips, J. Fletcher Farrell, L. V. Stanford, George H. Taber, Jr., A. E. Watts, v. p.; A. Steinmetz, sec.; J. Fletcher Farrell, treas.; George R. Lord, gen. supt. of refs.; J. W. Carnes, s. m. (tank car and bulk stations); John S. Hess, c. e.; E. B. Phillips, c. c.; H. B. Malone, p. a. Refineries located at East Chicago, Ind.; Kansas City, Kans.; Coffeyville, Kans.; Houston, Tex.; Marcus Hook, Pa.; Wellsville, N. Y.; Sand Springs, Okla.; Fort Worth, Tex.; Gladewater, Tex. Refinery at Kansas City, Kans., shut down. This company is a subsidiary of the Consolidated Oil Corp.

LARGE REFINERY IN WESTERN TEXAS



El Paso, Tex., refinery of the Pasotex Petroleum Co. (Standard Oil Co. of California). Plant now has a crude oil capacity of 14,000 bbls. daily with cracking capacity of 4,000 bbls. daily. Wiggins floating roof (pan type) in foreground.

Personnel of Operating Refineries in United States

Skelly Oil Co., Skelly Bldg., Tulsa, Okla. W. G. Skelly, pres. and g. m.; C. C. Herndon, H. M. Stalcup, R. T. Lyons, W. T. Atkins, v. p.; F. T. Hopp, sec. and treas.; Emby Kaye, gen. supt. of ref.; K. J. Smith, supt., and H. V. Smith, asst. supt., Eldorado, Kans.; W. T. Atkins, s. m. (tank car and bulk stations); A. Ayvazian, c. e.; E. A. Todd, c. e.; F. W. Robertson, p. a. Refinery located at Eldorado, Kans.

Slack Petroleum Co., 1224 Hunt Bldg., Tulsa, Okla. (Privately owned by Ellis G. Slack.) C. E. Wheeler, asst. supt., Willow Springs (Longview P. O.), Tex. Plant shut down at present.

Snow Cap Oil Co., Sunburst, Mont. Adam J. Eulberg, pres. and g. m.; Edward F. Eulberg, v. p. Refinery located at Sunburst, Mont.

Southern Oil Refining Co., Kilgore, Tex. L. H. Gray, owner and operator of refinery at Kilgore, Tex.

Southwest Refining & Sales Co., 3000 Walnut Ave., Long Beach, Calif. R. W. Moore, pres., g. m. and s. m. (tank car); E. P. Ferry, treas.; F. P. Coleman, supt.; W. A. Shaffer, c. e. Refinery at Long Beach, Calif.

Spartan Refining Co., Inc., P. O. Box 1607, Shreveport, La. E. R. Ratcliff, pres.; B. H. Gray, S. D. Hunter, J. K. Wadley, v. p.; J. F. Atkins, sec.; B. H. Gray, treas.; D. H. Christman, gen. supt. of ref.; D. H. Christman, supt., J. K. MacKinnon, asst. supt., Shreveport, La.; R. R. Brinkman, s. m. (tank car); D. L. Edmondson, c. e.; H. O. Sivess, c. e.; M. W. Bass, p. a. Refinery located at Shreveport, La.

Standard Oil Co. of Louisiana, Baton Rouge, La. J. C. Hilton, pres.; A. K. Gordon, H. H. Hewetson, J. A. Bechtold, J. E. Kkehan, v. p.; A. K. Gordon, treas.; J. A. Bechtold, sec.; M. J. Rathbone, supt.; J. E. Skehan, gen. s. m.; T. H. Taylor, asst. s. m. Refinery located at Baton Rouge, La.

Star Refining & Producing Co., Fort Worth, Tex. W. M. Harrison, pres. and g. m.; Herman Gartner, v. p.; Clara Mabry, sec. and treas.; H. L. Pemberton, supt., Fort Worth, Tex.; H. Atherton, s. m. (tank car and bulk stations); W. M. Harrison and H. L. Pemberton, p. a. Refinery located at Fort Worth, Tex.

Sterling Refining Co., Oklahoma City, Okla. W. G. Johnson, pres.; B. F. Green, L. W. Pratt, v. p. Refinery located at Oklahoma City.

Stone Oil Co., 2115 Second National Bank Bldg., Houston, Tex. R. W. Stone, pres. and g. m.; H. M. Stone, gen. supt. of ref. and v. p.; R. D. Breed, sec. and treas. Refinery located at Texas City, Tex.

Standard Oil Co. of California, 225 Bush St., San Francisco, Calif. K. R. Kingsbury, pres.; W. H. Berg, Oscar Sutro, R. W. Hanna and H. D. Collier, v. p.; J. H. Tuttle, sec.; V. F. Palmer, treas. Refineries at Richmond, El Segundo and Bakersfield, Calif.

Standard Oil Co. (Indiana), 910 South Michigan Ave., Chicago, Ill. Edward G. Seubert, pres.; Allan Jackson, v. p. in charge of sales; Robert H. McElroy, v. p. in charge of traffic; Edward J. Bullock, v. p. in charge of purchasing; Robert E. Humphreys, v. p. in charge of mfg.; A. W. Peak, v. p. in charge of prod.; Charles J. Barkdull, v. p. and treas.; Felix T. Graham, sec.; Max G. Paulus, g. m. of mfg.; Harry F. Glair, asst. g. m. of mfg.; Robert E. Wilson, asst. to v. p. and gen. research director in charge of development and patent dept.; O. E. Bransky, m., E. J. Shaeffer, gen. supt., F. D. Rexwinkle, P. J. Sweeny, M. R. Schmidt, asst. gen. supt., Whiting, Ind.; C. B. Manbeck, m., S. A. Montgomery, gen. supt., F. J. Gainer, asst. supt., Wood River, Ill.; G. H. Moffett, m., and H. R. Boehmer, supt., Sugar Creek, Wyo.; Amos Ball, g. m. of sales; E. Bogardus, asst. to v. p. in charge of sales; J. F. Hewson, p. a. Refineries located at Whiting, Ind.; Wood River, Ill., and Sugar Creek, Wyo. Company also operates refineries through following subsidiaries: Stanolind Oil & Gas Co., Pan American Petroleum & Export Co. and Midwest Refining Co. See these companies for detailed report.

Standard Oil Co. (Kansas), Neodesha, Kans. A. S. Hopkins, pres.; E. A. Warren, v. p. and s. m.; A. L. Morrison, sec. and treas.; E. A. Metcalf, supt., E. A. Bailey, asst. supt., Neodesha, Kans.; A. M. Burton, c. e.; L. J. Catlin, c. e.; W. H. Hill, p. a. Refinery located at Neodesha, Kans.

Standard Oil Co. (Kentucky), 426 W. Bloom Ave., Louisville, Ky. William E. Smith, pres. and s. m. (tank car); W. G. Violette, J. C. Steidle, v. p.; Thomas Q. McGoodwin, sec.; J. C. Steidle, treas.; W. G. Violette, s. m. (stations); William Glossop, c. e.; Louis F. Heitz, c. e.; J. W. Bell, p. a.

Standard Oil Co. of New Jersey, 26 Broadway, New York, N. Y. Charles G. Black, pres.; George W. McKnight, C. G. Sheffield, Richardson Pratt, v. p.; Charles T. White, sec.; R. P. Resor, treas.; F. W. Abrams, g. m. New Jersey refs.; E. A. Rudigier, southern g. m. Refineries located at Bayonne, N. J.; Linden, N. J.; Jersey City, N. J.; Baltimore, Md.; Parkersburg, W. Va.; Charleston, S. C. This company is a subsidiary of Standard Oil Co. (New Jersey) New York, N. Y.

Standard Oil Co. of New York, Inc., 26 Broadway, New York, N. Y. Frederick S. Fales, pres.; Peter M. Speer, John A. Brown, Frederick Ewing, William B. Walker, Arthur F. Corwin, Frederick Ewing, v. p.; Henry Fisher, sec.; Richard P. Tinsley, treas.; Wilbur F. Burt, g. m.; F. S. Shepard, supt., W. J. Mooney and J. T. Palmer, asst. supt, Sone & Fleming, Brooklyn; R. B. Malone, supt.; J. C. Allen, asst. supt., Pratt works, Long Island City; F. W. Hadley, supt., Pratt works, Brooklyn; A. E. Esser, supt., R. T. Lockwood and G. W. Armstrong, asst. supt., Buffalo; C. W. Schaeffer, supt.; H. S. Muck and G. H. Barker, asst. supt., Providence; Frederick S. Fales, s. m. (tank car and bulk stations); C. A. Ellis, c. e.; Dr. J. B. Rather, c. c.; R. W. Hamlet, p. a. Refineries located at Brooklyn and Long Island City, N. Y.; Buffalo, N. Y., and Providence, R. I.

Standard Oil Co. of Ohio, Sixteenth Floor, Midland Bldg., Cleveland, Ohio. W. T. Holliday, pres.; A. M. Maxwell, George A. Burke, v. p.; F. H. Kelly, sec.; W. J. Semple, treas.; L. S. Bale, gen. supt. of ref.; A. H. Buchanan, supt., Cleveland, Ohio, No. 1 Works; L. B. Helm, supt., Cleveland, Ohio, No. 2 Works; G. W. Hannekin, supt., Toledo, Ohio; E. A. Brown, supt., Montague Ball, asst. supt., Latonia, Ky.; E. A. Brown, supt., Lima, Ohio; A. A. Stambaugh, s. m. (tank car and bulk stations); L. S. Bale, c. e.; Dr. R. E. Burk, c. c.; C. A. Sherwood, p. a. Refineries located at Cleveland, Ohio; Toledo, Ohio; Latonia, Ky.; Lima, Ohio.

Stanolind Oil & Gas Co., Philcade Bldg., Tulsa, Okla. F. O. Prior, pres.; A. M. McCorkle, E. F. Bullard, v. p.; F. J. Keleher, sec. and treas.; O. W. White, gen. supt. of ref.; O. W. White, supt., Superior, La.; F. J. Keleher, s. m. (tank car); W. L. James, p. a. Refinery located at Superior, La. This company is a subsidiary of Standard Oil Co. (Indiana), Chicago, Ill.

Starlight Refining Co., Karns City, Pa. W. J. Anderson, pres and g. m.; W. B. Purvis, pres.; Zeno Henninger, sec. and treas.; W. J. Anderson, s. m. (tank car), c. e., c. c. and p. a. Refinery located at Karns City, Pa.

Stellar Refining Co., Marne, Ohio. W. V. Buchanan, mgr. and supt. of ref. Refinery located at Marne, near Newark, Ohio.

St. Helens Petroleum Co., Ltd., 1026 Western Pacific Bldg., Los Angeles, Calif. C. B. Stocken, c. of b., Kern House, London, Eng.; R. W. Stephens, chm. management committee; A. P. McEchern, sec.; Charles Drader, g. m. and gen. supt. of ref.; C. Z. Webb, supt. and c. e., Pico, Calif.; C. W. Spark, asst. supt. and c. c.; C. N. Collins, s. m. (tank car and bulk stations); W. H. Cowie, p. a.

Stoll Oil Refining Co., Inc., 227 West Main, Louisville, Ky. C. C. Stoll, pres.; George Stoll, v. p. in charge of sales; Berry V. Stoll, v. p. in charge of ref.; Charles E. Stoll, v. p. in charge branches and stations; William A. Stoll, sec. and treas.; Albert S. Prinz, comptroller; J. W. Kittner, gen. supt. of ref.; J. W. Kittner, supt., and Clem Luce, Covington Arterburn, George Kittner, asst. supt., Louisville, Ky.; George Stoll, s m. (tank car); Charles E. Stoll, s. m. (bulk stations); Covington Arterburn, c. e.; Clem Luce, c. c. Refinery located at Louisville, Ky.

Sun Oil Co., 1608 Walnut St., Philadelphia, Pa. J. Howard Pew, pres.; J. N. Pew, Jr., J. Edgar Pew, S. B. Eckert, A. E. Pew, Jr., v. p.; Frank H. Cross, sec. and treas.; W. D. Mason, supt., Marcus Hook, Pa.; H. O. Cameron, supt., Toledo, Ohio.; C. B. Carter, supt., Yale, Okla.; S. S. Eckert, v. p. in charge of sales; Dr. Gellert Alleman, c. e.; W. H. Booth, p. a. Refineries located at Marcus Hook, Pa.; Toledo, Ohio, and Yale, Okla.

Sunray Oil Co., Philcade Bldg., Tulsa, Okla. C. H. Wright, receiver; R. P. Abele, v. p.; W. D. Forester, sec.; F. L. Martin, g. m. of ref.; R. L. Johnson, supt., D. Winson, asst. supt., Allen, Okla.; F. L. Martin, s. m. (tank car); R. L. Johnson, c. e.; R. D. Paulger, p. a. Refinery located at Allen, Okla.

Superior Oil Works, Warren, Pa. R. Z. Morrison, pres.; F. C. Eaton, v. p.; H. G. Eaton, sec., treas. and g. m.; Harry E. Peterson, supt. of ref.; H. G. Eaton, s. m. (tank car); R. B. Allmendinger, c. c.; H. G. Eaton, p. a. Refinery located at Warren, Pa.

Superoil Co., Tiffin and Weaver Sts., Toledo, Ohio. F. S. Jerome, pres.; R. R. Adams, v. p.; C. L. Hopkins, sec.; T. E. Keen, treas. and g. m. J. J. Curran, supt., L. A. Curran, asst. supt., Toledo, Ohio; T. E. Keen, s. m. (bulk stations) and p. a. Refinery located at Toledo, Ohio.

T

Taxman Refining Co., Wichita Falls, Tex. J. J. Taxman, pres.; Maynard Taxman, v. p., sec. and treas.; J. J. Taxman and Maynard Taxman, s. m. (tank car); C. W. Hulland, p. a. Refinery (shut down) located at Wichita Falls, Tex.

Taylor Refining Co., Taylor, Tex. G. L. Rowsey, pres. and g. m.; C. W. Cahoon, Jr., v. p. and s. m. (tank car and bulk stations); C. H. Booth, Jr., sec. and treas.; J. L. Bryan, supt., Ted Woodruff, asst. supt., Tyler, Tex.; J. F. Whitehurst, supt., Taylor, Tex.; B. H. Perkinson, c. e.; G. R. Whitner, c. c.; G. L. Rowsey, p. a. Refineries located at Tyler and Taylor, Tex.

Terra Bella Refining Co., Ltd., Terra Bella, Calif. H. P. Mitchell, pres. and g. m.; Allen F. Bullard, v. p.; Frank Stephenson, sec.; F. L. Kennedy, treas.; A. V. Replee, supt. and L. D. Lavering, asst. supt. at Terra Bella, Calif. Refinery located at Terra Bella, Calif.

The Texas Company (California), 929 South Broadway, Los Angeles, Calif. R. C. Holmes, pres.; C. E. Olmstead, J. A. Bermingham, R. T. Herndon, W. K. Holmes, W. S. S. Rodgers, v. p.; E. M. Crone, sec.; C. E. Woodbridge, treas.; W. K. Holmes, m. of ref. dept.; W. J. Ryan, supt., Los Angeles; J. R. Scanlin, supt., Fillmore, Calif.; R. T. Herndon, in charge of sales; A. F. Colling, p. a. Refineries located at Los Angeles, Fillmore and Coalinga (shut down), Calif. This company is a subsidiary of The Texas Company (Delaware).

The Texas Company (Delaware), 135 East Forty-second St., New York, N. Y. R. C. Holmes, pres.; C. B. Ames, T. J. Donoghue, F. T. Manley, G. L. Noble, R. Ogarrio, T. Rieber, W. S. S. Rodgers, v. p.; E. M. Crone, sec.; C. E. Woodbridge, treas.; L. R. Holmes, m. of ref. dept.; F. P. Dodge, gen. supt. of ref.; G. T. Stevens, supt., Houston, Tex.; W. H. Hoffman, supt., West Dallas, Tex.; R. E. Mossman, supt., West Tulsa, Okla.; R. G. Collins, Amarillo, Tex.; A. E. Higgs, supt., El Paso, Tex.; T. J. Landry, supt., Sunburst, Mont.; G. B. Bogart, supt., Lockport, Ill.; L. F. J. Wilking, supt., Casper, Wyo.; G. D. Evans, supt., La Barge, Wyo.; T. G. Dellinger, supt., Port Arthur, Tex.; F. S. Dengler, supt., Port Neches, Tex.; R. H. Donaldson, supt., Shreveport, La.; J. R. Reed, supt., Pryse, Ky.; H. A. Fouts, supt., San Antonio, Tex.; G. T. Stevens, supt., Amarillo, Tex.; G. O. Shefstead, supt., Craig, Colo.; V. B. Pevoto, supt., Norfolk, Va.; C. G. Cramer, supt., Marcus Hook, Pa.; T. Wall, supt., Providence, R. I.; W. S. S. Rodgers, v. p. in charge of sales; H. W. Dodge, gen. s. m.; T. Rieber, v. p. in charge of foreign sales; A. F. Colling, p. a. Refineries located at Port Arthur, Port Neches, Houston, San Antonio, El Paso, Amarillo and West Dallas, Tex.; Lockport, Ill.; Shreveport, La.; Pryse, Ky.; LaBarge, Wyo.; Craig, Colo.; Cody, Wyo. (shut down); Sunburst, Mont.; Norfolk, Va.; Marcus Hook, Pa., and Providence, R. I.

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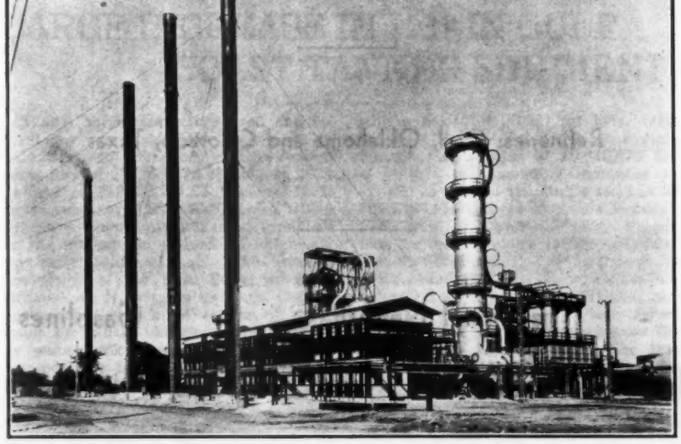

Installation at new Montreal refinery of British American Oil Co. Built by Winkler-Koch Engineering Co.

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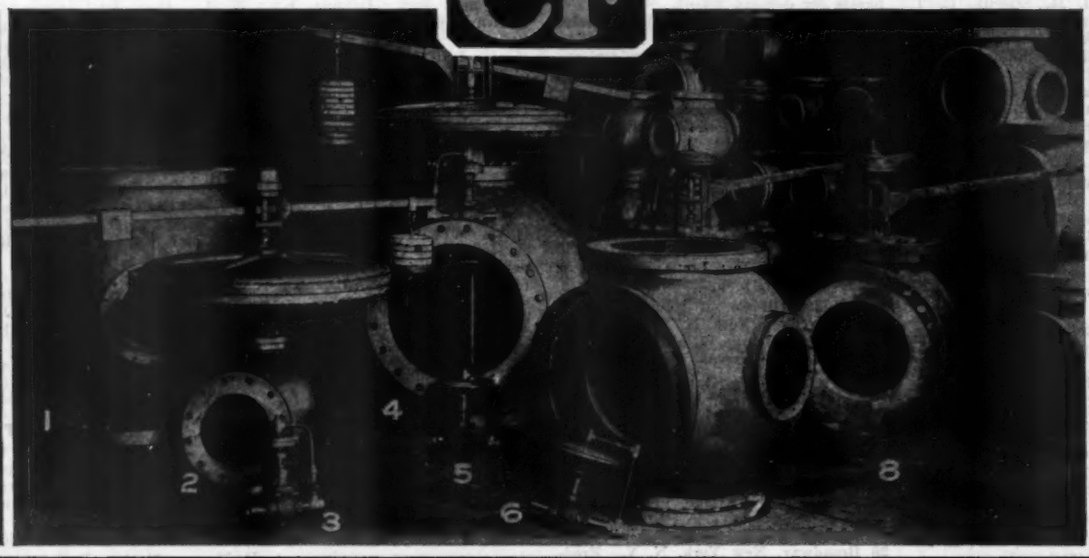
1 BODY FOR TWENTY-FOUR-INCH LOW PRESSURE REGULATOR.

2 A TEN-INCH DIFFERENTIAL REGULATOR.

3 A THREE-FOURTHS INCH HIGH PRESSURE REGULATOR.

4 TWENTY-FOUR-INCH DIFFERENTIAL REGULATOR FOR MIXING GASES.



5 ONE-INCH HOUSE REGULATOR.

6 ONE AND ONE-HALF INCH HOUSE REGULATOR.

7 BODY OF A TWENTY-INCH WEIGHTED ILLUMINATING REGULATOR.

8 A SIXTEEN-INCH HIGH PRESSURE REGULATOR.

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Personnel of Operating Refineries in United States

Texas-Mexican Oil & Refining Co., Laredo, Tex. M. T. Cogley, pres.; G. B. Carden, sec. and treas. Refinery at Laredo, Tex.

Texas Pacific Coal & Oil Co., Thurber, Tex. (Executive Fort Worth). E. J. Marston, pres.; E. R. Lederer, O. E. Mitchell, v. p.; R. Seible, sec. and treas.; E. R. Lederer, g. m. of ref.; G. M. Pfau, supt., C. A. Barere, asst. supt., Fort Worth, Tex.; T. A. Pomeroy, supt., H. M. Pratt, asst. supt., Wynnewood, Okla.; D. Hiatt, supt., Caddo, Tex.; F. D. Bostaph, s. m. (tank car); M. Farnsworth, s. m. (bulk stations); H. H. Pruitt, c. e.; E. W. Fublin, c. e.; J. C. Davis, p. a. Refineries located at Fort Worth, Tex.; Wynnewood, Okla.; Caddo, Tex.

Texas Petroleum Products Co., Somerset, Tex. Grover C. Shaw, pres. and g. m.; F. H. Witherspoon, v. p.; W. I. Lighthouse, sec., treas., s. m. (tank car) and p. a.; G. B. Dartois, supt., Somerset, Tex. Refinery located at Somerset, Tex.

Tidal Refining Co., Box 2046, Tulsa, Okla. Noel Robinson, pres.; C. R. Barton, v. p.; Y. P. Broome, sec.; K. R. Hankinson, treas.; C. R. Barton, g. m.; R. S. Stanfield, gen. supt. of ref.; R. S. Stanfield, supt., Drumright, Okla.; J. W. Warner, sec. and treas.; M. D. Harris, c. e.; R. W. Boyd, c. e.; P. W. Fenton, p. a. Refinery located at Drumright, Okla. This company is a subsidiary of Tide Water Oil Co.

Tide Water Oil Co., 17 Battery Place, New York, N. Y. Axtell J. Byles, pres.; Edward L. Shea, Noel Robinson, Edward H. Sabin, v. p.; Francis I. Fallon, sec.; K. R. Hankenson, treas.; Noel Robinson, mgr.; R. D. Rogers, gen. supt.; L. C. Quackenbush, s. m. (tank car); J. D. Collins, s. m. (bulk stations); E. Ellsberg, c. e.; L. W. Parsons, c. e.; C. H. Bickell, p. a. Refinery located at Bayonne, N. J. This company is a subsidiary of Tide Water Associated Oil Co., New York, N. Y.

Tiona Refining Co., 1136 Widener Bldg., Philadelphia, Pa. E. M. Lyons, pres.; C. A. Boler. v. p.; William A. Powell, sec. and treas.; H. W. Walchli, supt., Clarendon, Pa. Refinery located at Clarendon, Pa.

Toole County Refining Co., Oilmont, Mont. G. C. Hoyt, pres.; J. A. Coons, sec. and treas. Refinery located at Oilmont, Mont.

Triangle Oil & Refining Co., 21 Avenue 43, Venice, Calif. Joseph Spray, pres.; E. F. Jones, plant supt. Refinery located at Playa Del Rey, Calif.

Tri-State Refining Co., Ashland, Ky. Paul G. Blazer, pres. and g. m.; G. C. Davison, v. p.; Homer E. Holt, sec.; R. W. Grossenbach, treas.; W. D. Manz, gen. supt. of ref.; E. F. Wells, s. m. (tank car); A. A. Hines, s. m. (bulk stations); C. C. Compton, c. e.; A. R. Trengrove, c. e.; R. W. Grossenbach, p. a. Refinery located at Kenova, W. Va.

U

U. S. Oil Refining Co., New Orleans, La. E. L. Chapman, pres.; S. E. Wilson, v. p.; H. M. Gilbert, sec., treas., g. m. and gen. supt. of ref.; H. M. Gilbert, p. a. Refinery located at Southport (New Orleans), La.

Ultra-Penn Refining Co., P. O. Box 914, Butler, Pa. H. C. Eaton, pres. and g. m.; William Fletcher, H. H. Phillips, v. p.; F. C. Dodds, sec. and treas.; William G. Wagner, gen. supt. of ref. Refinery located at Bruin, Pa.

Union Asphalt Co., El Dorado, Ark. J. B. Sowell, pres.; E. F. O'Byrne, v. p.; L. A. Rankin, sec. and treas.; R. L. Moore, supt.; E. F. O'Byrne, s. m. Asphalt plant located at El Dorado.

Union Oil Co. of California, 617 West Seventh St., Los Angeles, Calif. L. P. St. Clair, pres.; R. D. Matthews, W. W. Orcutt, P. N. Boggs, W. L. Stewart, Jr., and Paul M. Gregg, v. p.; John McPeak, sec.; J. M. Rust, treas.; A. Roy Heise, supt., Oleum; R. W. Frazier, supt., Avila; H. Ambrosier, supt., Maltha (Bakersfield); C. W. Burtless, supt., Santa Paula; C. G. Brownlee, supt., Los Angeles; H. C. Farquhar, p. s.; V. H. Kelly, s. m. (tank car); J. M. Geary, s. m. (bulk stations); L. G. Metcalf, c. e.; Dr. D. R. Merrill, c. e. Refineries located at Wilmington, Oleum, Bakersfield, Brea, Avila and Santa Paula, Calif.

United Refining Co., Warren, Pa. F. G. Bannerot, pres.; H. A. Logan, v. p., treas. and g. m.; H. W. Schmidt, sec.; H. J. Miner, supt., John Cameron, asst. supt., Warren, Pa.; H. A. Logan and H. W. Schmidt, s. m. (tank car); McLean Houston, prod. m.; Herbert Wagner, c. e. Refinery located at Warren, Pa.

Utah Oil Refining Co., Newhouse Bldg., Salt Lake City, Utah. T. A. Dines, pres.; William R. Wallace, A. N. Johnson and M. J. Greenwood, v. p.; A. N. Johnson, sec. and treas.; E. S. Holt, supt., Frank L. Arnold, asst. supt., Salt Lake City, Utah; A. S. Brown, s. m. (tank car); M. H. Sutton, s. m. (bulk station); Gordon I. Kirby, c. e.; W. H. Lovesy, p. a. Refinery located at Salt Lake City, Utah.

V

Vacuum Oil Co., Inc., 61 Broadway, New York, N. Y. Herbert Baker, c. of b.; C. E. Arnott, v. c. and pres.; W. M. McGee, C. E. Bedford, H. F. Sheets, C. L. Jones, v. p.; G. V. Holton, sec.; H. S. McKinney, treas.; J. S. McElfresh, supt., Paulsboro, N. J.; J. F. Turner, supt., Olean, N. Y. Refineries located at Paulsboro, N. J.; Olean, N. Y. This company is a subsidiary of Socony-Vacuum Corp., New York, N. Y.

Valley Refining Co., Box 407, Roswell, N. Mex. S. W. Lodewick, pres. and g. m.; H. C. Buchly, v. p.; S. P. Johnson, Jr., sec. and treas.; E. A. Wahline, gen. supt. of ref. Refinery located at Roswell, N. Mex.

Valvoline Oil Co., Carew Bldg., Cincinnati, Ohio. E. W. Edwards, chairman; H. W. Edwards, pres.; A. J. Leroux, v. p. and g. m.; H. M. Hart, v. p.; C. C. Gould, sec.; R. P. Vogele, treas.; C. W. Luton, g. m. of ref.; C. M. Noyes, supt., A. Hagan, asst. supt., Butler, Pa.; H. J. Dunmire, supt., J. L. Jones, asst. supt., Warren, Pa.; C. A. Miller, supt., Henry Winkler, asst. supt., Franklin, Pa.; L. L. Long, s. m. (tank car); J. J. McGraw, s. m. (bulk stations); Robert Stanley, c. e.; Louis Calkins, c. e.; E. H. Shepherd, p. a. Refineries located at Butler, Warren and Franklin, Pa.

Vernon Oil Refining Co., 2500 East Twenty-sixth St., Los Angeles, Calif. J. A. Brower, pres.; E. O. Brower, v. p.; W. N. Brower, sec. and s. m. (tank car); W. G. Darlington, supt.; P. T. Hinman, s. m. (bulk stations). Refinery at Vernon, Calif.

Vickers Petroleum Co. of Delaware, Wheeler Kelly Hagny Bldg., Wichita, Kans. J. A. Vickers, pres.; C. L. Henderson, v. p. and g. m.; John S. Wertz, sec. and treas.; A. M. Schrepfer, gen. supt. of ref.; A. M. Schrepfer, supt., and R. N. Moore, asst. supt., Potwin, Kans.; Myers Gross, s. m. (tank car); H. G. Shaw, p. a. Refinery located at Potwin, Kans. Plant under construction at Raymond, Kans.

Viking Oil Corp., Brown Ave., Clarendon, Pa. L. C. Jamieson. pres. and treas.; R. W. Clark, v. p. and sec.; George H. Seager, supt., Clarendon, Pa. Refinery located at Clarendon, Pa.

V. O. E. Refining Co., Gladewater, Tex. V. O. E. Knight, pres.; Jess Bartlett, supt. Refinery at Gladewater.

W

Waggoner Refining Co., Inc., Electra, Tex. W. T. Waggoner, pres.; R. L. More, sec.; D. G. Gray, g. m.; M. S. Ellred, gen. supt. of ref.; M. S. Ellred, supt., H. A. Mitchell, asst. supt., Electra, Tex.; H. D. Jenkins, s. m. (tank car); C. C. Jones, s. m. (bulk stations); J. T. McNamara, p. a. Refinery located at Electra, Tex.

Warner-Quinlan Co., 2 Park Ave., New York City. W. W. McFarland, pres.; Frank Frankel, v. p.; George Frankel, sec. and treas.; I. K. Giles, supt., R. R. Gover, asst. supt., Warners, N. J.; W. N. Schlegel, s. m. (tank car); B. Frankel, s. m. (bulk stations); R. R. Gove, c. e.; I. K. Giles, c. e.; Sam Secular, p. a. Refinery located at Warners, N. J.

Waverly Oil Works Co., Koppers Bldg., Pittsburgh, Pa. C. M. Barr, pres.; S. M. Vockel, v. p.; A. G. Boal, sec.; S. K. Cunningham, treas.; W. H. Millhiser, gen. supt. of ref.; W. H. Millhiser, supt., Pittsburgh, Pa.; W. H. Millhiser, supt., Coraopolis, Pa.; J. F. King, s. m. (tank car); W. T. Sieber, c. e.; W. H. Millhiser, p. a. Refineries located at Pittsburgh and Coraopolis (shut down), Pa.

Western Oil & Refining Co., 416 West Eighth St., Los Angeles, Calif. Richard Florian, pres.; A. W. Taylor and R. R. Rakestraw, v. p.; A. A. G. Scherbel, sec.-treas.; Robert C. Gillis, receiver; F. E. Lee, gen. adm. agt.; R. R. Rakestraw, gen. supt. of ref. and c. e.; O. C. Smith, supt., and H. H. Spangler, asst. supt. at Wilmington, Calif.; A. W. Taylor, s. m. (tank car and bulk stations); J. G. Danforth, c. e.; J. S. Baum, p. a. Refinery at Wilmington, Calif.

Western Oil Corp., Philcade Bldg., Tulsa, Okla. J. F. Darby, pres.; George W. Snedden, v. p.; C. F. Lynde, sec. and treas.; J. R. Travis, supt., T. S. Stribling, asst. supt., Beckett, Okla.; I. H. Patton, Jr., s. m. (tank car). Refinery located at Beckett, Okla.

Western States Petroleum Corp., 114 Sansome St., San Francisco, Calif. R. L. Durbrow, pres. and g. m.; B. F. Garrett, v. p.; M. C. Lintell, sec. and treas.; L. Y. Mattes, supt.; E. E. Greiner, asst. supt.; F. C. Squier, c. c. Refinery located at Long Beach, Calif.

White Eagle Oil Corp., 1400 Federal Reserve Bank Bldg., Kansas City, Mo. R. R. Irwin, pres.; E. A. Kermott, R. D. Mering, James P. Kem, v. p.; L. L. Marcell, c. of b.; L. E. Hanson, sec.; E. A. Kermott, treas.; E. C. Marshall, g. m. of ref.; C. C. Durkee, supt., Augusta, Kans.; J. W. Glass, supt., Casper, Wyo.; H. L. McReynolds, s. m. (tank car); C. L. Jolliffe, s. m. (bulk stations); G. S. Dunham, c. e.; H. L. Bedell, c. c.; W. C. Etzbach, p. a. Refineries located at Augusta, Kans., and Casper, Wyo. This company is a subsidiary of Standard Oil Co. of New York, New York, N. Y.

White Oak Corp., Hunt Bldg., Tulsa, Okla. Walter G. Johnson, pres.; Benjamin F. Green, Louis W. Pratt, v. p.; Benjamin F. Green, sec.; Louis W. Pratt, treas.; A. M. Smith, gen. supt. of ref.; G. T. Gray, supt., Allen, Okla.; L. W. Mitchell, supt., Oklahoma City, Okla.; R. H. van Eeghen, s. m. (tank car); R. H. Henderson, c. c.; D. J. Hanrahan, p. a. Refineries located at Allen, Okla., and Oklahoma City, Okla.

White Star Refining Co., 903 West Grand Blvd., Detroit, Mich. H. A. Coffin, pres.; L. R. Hunter, v. p. and s. m. (bulk stations); C. B. McCollough, sec.; W. V. Butler, treas.; S. G. Keller, supt., Wood River, Ill.; A. F. Zoll, supt., Trenton, Mich.; C. B. McCollough, s. m. (tank car); N. W. Strale, c. e.; E. H. Potthoff, c. c.; J. G. Pyke, p. a. Refineries located at Wood River, Ill., and Trenton, Mich. This company is a subsidiary of Vacuum Oil Co., Inc., New York, N. Y.

Wickett Refining Co., Wickett, Tex. W. B. Hassett, pres.; George W. Buckner, v. p., sec., treas. and s. m. (tank car); H. W. Miller, g. m., supt. and p. a. Refinery located at Clayton, Mo.

H. F. Wilcox Oil & Gas Co., Wilcox Bldg., Tulsa, Okla. Homer F. Wilcox, pres.; George A. Dye, Frank H. Dunn, Melvin P. Appleby, v. p.; Leslie J. Yarbrough, sec.; Melvin P. Appleby, treas.; Frank H. Dunn, gen. supt. of ref.; George A. Dye, g. m.; P. I. Tinkler, supt., Bristow, Okla.; John A. Oakes, supt., Pampa, Tex.; Harry E. Bangert, s. m. (tank car); L. G. Murrel, s. m. (bulk stations); Harold B. Ward, p. a. Refineries located at Bristow, Okla., and Pampa, Tex.

Wilshire Oil Co., 2455 East Twenty-seventh St., Los Angeles, Calif. George R. Machris, pres.; Alfred P. Machris, v. p. and sec. Refinery located at Vernon (Los Angeles), Calif.

Wirt Franklin Petroleum Corp., Ardmore, Okla. Wirt Franklin, pres.; F. M. Porter, C. A. Franklin, Frank M. Head, F. I. Cromwell, v. p.; Edward Galt, sec.; F. M. Porter, g. m.; E. Coffin, gen. supt. of ref.; C. A. Franklin, s. m. (tank car); J. S. Entriken, s. m. (bulk stations); Hugh A. Neal, c. c.; C. A. Franklin, p. a. Refinery located at Ardmore, Okla.

Wolverine-Empire Refining Co., Inc., Oil City, Pa., and 51 Madison Ave., New York, N. Y. C. H. Ellingwood, pres.; E. W. Chase, c. of b.; A. W. Scott, sec.; F. W. Baer; A. W. Cole, supt., Reno, Pa.; P. V. Ruhlman, supt.

Wyo Gas & Oil Co., Upton, Wyo. C. F. Martens, pres.; W. K. Poulson, sec. Refinery located at Upton, Wyo.

Y

Yale Oil Corp. of South Dakota, Drawer 60, Miles City, Mont. L. B. Hancock, pres. and treas.; P. N. Fortin, v. p., sec., g. m. and gen. supt. of ref.; R. D. Kinyon, supt., Billings, Mont.; P. N. Fortin, s. m. (tank car); W. P. McCracken, s. m. (bulk stations); T. R. Corbett, c. e. and c. c.; P. N. Fortin, p. a. Refineries located at Billings and Miles City, Mont.

Yale Oil Corp., Yale, Okla. L. B. Hancock, pres.; C. H. Gifford, v. p.; F. B. Hancock, sec., treas. and g. m.; Willard Shaw, gen. supt. of ref.; Willard Shaw, supt., Yale, Okla.; F. B. Hancock, s. m. (tank car), p. a. Refinery located at Yale, Okla.

LARGE INCREASE IN 1931 IN GULF COAST TANKER SHIPMENTS

Tanker shipments of crude oil and refined products from Gulf Coast ports to Atlantic Coast terminals and to foreign ports totaled 217,571,728.41 bbls. in 1931 as against 212,382,251.94 bbls. in 1930, an increase of 5,189,476.47 bbls., which gain was almost altogether in crude oil as the increase in refined oil shipments was only 14,824.06 bbls. The gigantic production of the East Texas oil field, situated as it is close to Gulf Coastal ports, supplied a large volume of cheap crude for tanker shipments and shippers by water took advantage of it and increased their tanker deliveries by 5,174,652.41 bbls. over those of 1930.

The Humble Oil & Refining Co. was the largest shipper of crude oil, with tanker deliveries of 28,535,160 bbls., an average of 78,179 bbls. per day.

The Gulf Refining Co. was the largest coastwise shipper of refined products with a record of 25,651,257 bbls. during the year, but the Humble Oil & Refining Co. shipped a total of 30,635,673 bbls. of refined oil, including coastwise and export, as against the Gulf's total of 27,532,758 bbls. and the Magnolia Petroleum Co.'s total of 22,570,931 bbls. In addition to the Humble's tanker shipments, the Standard Oil Co. of Louisiana, another Standard (New Jersey) subsidiary, shipped a total of 17,088,784 bbls., making the total Standard (New Jersey) shipments of refined products from Gulf Coastal ports 47,724,457 bbls. The Texas Company's water shipments of refined products coastwise and export were 21,381,296 bbls.

Following is the record of shipments, with fractional parts of barrels omitted for typographical convenience:

(Continued on Page 117)

Survey of Operating Refineries By States

CALIFORNIA (Continued)

(Continued from Page 61)

Company and plant location—	Crude oil cap.	Crack. cap.	Type of plant	Type of cracking plant
General Pet. Corp., Vernon	50,000	.....	S-L	
General Pet. Corp., Torrance	35,000	.....	S	
General Pet. Corp., Lebec	12,000	.....	S	
Gilmore Oil Co., Ltd., Los Angeles	2,500	.....	S-A	
Gilmore Oil Co., Ltd., Los Angeles	2,000	.....	S	
Gilmore Oil Co., Ltd., Orcutt	700	.....	S-A	
Hancock Oil Co., Long Beach	12,500	.....	S	
Kettleman Hills Gasoline Co., Hanford	2,500	.....	S	
Lake View Oil & Ref. Co., Maricopa	3,000	.....	S	
Macmillan Pet. Corp., Long Beach	7,000	.....	S	
Monarch Refineries, Venice	3,000	.....	S	
Norwalk Co., Maricopa	5,000	.....	S	
Olympic Ref. Co., Long Beach	5,500	.....	S	
McCallen, M. M., Ref. Co., Huntington Beach	400	.....	A	
Paraffine Co., Inc., Emeryville	1,200	.....	A	
Petrol Corp., Los Angeles	6,000	.....	S-A	
Pioneer Paper Co., Vernon	700	.....	A	
Richfield Oil Co., Watson	50,000	16,000	Comp.	Black
Rio Grande Oil Co., South Gate	10,000	2,000	S-C	Jenkins
Seaside Oil Co., Ventura	5,000	.....	S-A	
Seaside Oil Co., Summerland	2,000	.....	A	
Shell Oil Co., Wilmington	47,000	18,400	S-C	Dubbs
Shell Oil Co., Martinez	25,000	23,000	Comp.	Dubbs & Converter
Shell Oil Co., Coalinga	4,000	.....	S	
Shell Oil Co., Domingues	.....	34,000	C	Dubbs
Southwest Ref. & Sales Co.	2,000	.....	S	
Standard Oil Co. of Calif., Richmond	100,000	18,200	Comp.	Richmond
Standard Oil Co. of Calif., El Segundo	100,000	36,300	Comp.	Modified Richmond
Standard Oil Co. of Calif., Bakersfield	25,000	.....	S-A	
St. Helens Pet. Co., Ltd., Nea Pico (Los Angeles County)	5,000	.....	S	
Terra Bella Ref. Co., Ltd., Terra Bella	400	.....	L	
The Texas Co. (Calif.), Los Angeles	30,000	5,500	Comp.	Holmes-Manley
The Texas Co. (Calif.), Fillmore	4,000	2,700	S-C	
Triangle Oil & Ref. Co., Venice	250	.....	S	
Union Oil Co. (Calif.), Wilmington	55,000	21,000	S-C-A	Cross
Union Oil Co. (Calif.), Oleum	30,000	.....	S-A-L	
Union Oil Co. (Calif.), Brea	6,000	6,000	S-C	Cross
Union Oil Co. (Calif.), Avila	10,000	3,000	S	Cross
Union Oil Co. (Calif.), Santa Paula	900	.....	S	
Vernon Oil Ref. Co., Vernon	2,000	.....	S	
Western Oil & Ref. Co.	15,000	4,200	S-C	Jenkins
Western States Pet. Corp., Long Beach	5,000	.....	S	
Wilshire Oil Co., Vernon	20,000	.....	S	
Total	806,850	200,300		

COLORADO

Continental Oil Co., Florence	3,000	*1,500	S-C	Burton
Continental Oil Co., Denver	1,500	800	S-C	Cross
Mountain States Ref. Co., Orchard	200	.....	S	
The Texas Company, Craig	1,000	1,500	S-C	Holmes-Manley
Raven Oil & Ref. Co., Rangely	100	.....	S	
Total	5,800	3,800		

*Owned by the Standard Oil Co. (Indiana).

GEORGIA

Atlantic Ref. Co., Brunswick	5,000	3,600	Comp.	Lewis
Mexican Pet. Corp. (Georgia), Savannah	4,000	.....	A	
Total	9,000	3,600		

ILLINOIS

Cross, Henry H., Co., Joliet	2,500	.....	S	
Globe Oil & Ref. Co., Lemont	5,000	3,000	S-C	Winkler-Koch
Indian Ref. Co., Lawrenceville	16,000	9,000	Comp.	Cross
Lincoln Oil Ref. Co., Robinson	10,000	7,600	Comp.	Holmes-Manley
Lubrite Ref. Corp., East St. Louis	3,500	2,500	S-C	Pratt Vapor Phase
Red River Ref. Co., Inc., Burnham	1,200	.....	L	
Shell Pet. Corp., Wood River	40,000	22,000	Comp.	Dubbs,Cross,T.V.P.
Standard Oil Co. (Indiana), Wood River	25,000	20,000	Comp.	Burton, Holmes-Manley
The Texas Company, Lockport	20,000	16,000	S-C-A	Holmes-Manley, DeFlorez, Pressure Coke
White Star Ref. Co., Wood River	5,500	3,000	S-C	Dubbs
Total	128,700	83,100		

INDIANA

Bartles-Maguire Oil Co., East Chicago	5,000	3,000	S-C	Jenkins, Winkler-Koch, Controlled Coil
Empire Oil & Ref. Co., East Chicago	25,000	15,000	S-C	Dubbs
Shell Pet. Corp., East Chicago	27,000	10,000	S-C	Dubbs
Sinclair Ref. Co., East Chicago	40,000	30,000	Comp.	Isom
Standard Oil Co. (Indiana), Whiting	75,000	65,000	Comp.	Burton, Cross, Holmes-Manley
Total	172,000	123,000		

KANSAS

Altitude Pet. Corp., Chanute	5,000	3,500	S-C	Jenkins
Barnsdall Refineries, Inc., Wichita	5,000	1,500	S-C	Dubbs

KANSAS (Continued)

Derby Oil Co., Wichita	8,000	3,000	S-C	Dubbs
Eldorado Ref. Co., Eldorado	4,000	2,000	S-C	Winkler-Koch
Golden Rule Ref. Co., Wichita	1,000	1,200	S	Jenkins
Kanotex Ref. Co., Arkansas City	12,000	5,000	S-C	Jenkins, Donnelly
National Ref. Co., Coffeyville	5,500	2,500	S-C-L	National
Phillips Pet. Co., Kansas City	8,000	2,000	S-C	Dubbs
Shell Pet. Corp., Arkansas City	22,000	7,500	S-C	Dubbs
Sinclair Ref. Co., Coffeyville	12,000	7,500	Comp.	Isom
Skelly Oil Co., Eldorado	18,000	18,000	S-C-A	Skelly
Standard Oil Co. (Kansas), Neodesha	20,000	15,000	S-C-A	Burton, Holmes-Manley
Vickers Pet. Co., Potwin	4,000	1,500	S-C	Dubbs
Vickers Pet. Co., Raymond*	1,000	.....	S	
White Eagle Oil Corp., Augusta	15,000	15,000	S-C	White Eagle
Total	140,500	85,200		

*Under construction.

KENTUCKY

Aetna Oil Service, Inc., Louisville	1,500	400	S-C	Fleming
Ashland Ref. Co., Inc., Catlettsburg	4,000	1,000	S-C	Dubbs
Bowling Green Ref. Co., Bowling Green	1,500	.....	S	
Glasgow Oil & Ref. Co., Glasgow	200	.....	S	
Greenville Ref. Co., Greenville	100	.....	S	
Latonia Ref. Corp. (Standard Oil Co. of Ohio), Latonia	8,000	4,500	S-C	Tube & Tank
Louisville Ref. Co., Inc., Louisville	4,000	1,800	S-C	Dubbs
Simrall Ref. Corp., Horse Cave	2,000	.....	S	
Stoll Oil Ref. Co., Louisville	3,500	2,500	S-C	Stoll
The Texas Company, Pryse	2,000	2,000	S-C-L	Holmes-Manley
Total	26,800	12,200		

LOUISIANA

Bayou State Ref. Corp., Houston	800	.....	L	
Chalmette Pet. Corp., Chalmette	6,500	1,500	S-C	Winkler-Koch
Gupeco Ref. Co., Inc., Alexandria	600	.....	L	
Louisiana Oil Ref. Corp., Bossier City	15,000	15,000	S-C	Tube & Tank
Louisiana Oil Ref. Corp., Shreveport	15,000	.....	S	
Mexican Pet. Corp. of La., Destrehan	20,000	.....	S-A	
Shell Pet. Corp., Norco	15,000	7,600	S-A-C	Dubbs
Stanolind Oil & Gas Co., Superior	5,000	2,200	S-C	Cross
Spartan Ref. Co., Inc., Shreveport	12,000	.....	S	
Standard Oil Co. of La., Baton Rouge	100,000	40,000	Comp.	Tube & Tank
U. S. Refining Co., Southport	*2,500	2,500	S-C	
The Texas Company, Ardis (Shreveport)	6,500	.....	S	
Total	198,900	68,200		

*Company is rebuilding plant to include cracking equipment.

MARYLAND

Continental Oil Co., Baltimore	10,000	6,400	S-C	Dubbs, Cross
Mexican Pet. Corp., Baltimore	8,000	.....	A	
Standard Oil Co. of New Jersey, Baltimore	32,000	61,600	Comp.	Tube & Tank
Total	50,000	68,000		

MASSACHUSETTS

Cities Service Ref. Co., East Braintree	20,000	6,300	Comp.	Doherty, Holmes-Manley
Colonial Beacon Oil Co., Everett	28,000	24,000	S-C-A	Tube & Tank
Total	48,000	30,300		

MICHIGAN

Naph-Sol Ref. Co., Muskegon	1,500	.....	S	
Old Dutch Ref. Co., Muskegon	3,000	.....	S	
Roosevelt Oil Co., Mount Pleasant	2,500	.....	S-L	
White Star Ref. Co., Trenton	7,000	3,600	S-C	Dubbs
Total	14,000	3,600		

MISSOURI

Joplin Ref. Co., Joplin	1,500	1,000	S-C	Jenkins
Standard Oil Co. (Indiana), Sugar Creek	18,000	15,000	Comp.	Burton, Holmes-Manley
Total	19,500	16,000		

MONTANA

(Some of the Montana plants do not operate during winter months)

Arro Oil & Ref. Co., Lewistown	2,000	800	S-C	Dubbs
Bighorn Oil & Ref. Co., Billings	4,000	.....	S-A	
Big West Oil Co., Kevin	1,200	.....	S	
Boris A. S. Aronow, Kalispell	200	.....	S	
Boris A. S. Aronow, Havre	200	.....	S	
Conrad Ref. Co., Conrad	1,500	.....	S	
Continental Oil Co., Lewistown	1,500	.....	S	
Hart Refineries, Hedgesville	100	.....	S	
Hart Refineries, Missoula	300	.....	S	
Northwest Stellarene Co., Shelby	2,000	.....	S	
Russell Oil Co., Butte	1,000	.....	S	
Russell Oil Co., Billings	1,800	.....	S	
Snow Cap Oil Co., Sunburst	350	.....	S	
The Texas Company (International), Sunburst	4,500	3,000	S-C	DeFlorez
Toole County Ref. Co., Oilmont	300	.....	S	
Yale Oil Corp. of S. D., Billings	3,000	.....	S	
Total	23,950	3,800		

Survey of Operating Refineries By States

NEW JERSEY

Company and plant location—	Crude oil cap.	Crack. cap.	Type of plant	Type of cracking plant
Barber Asphalt Co., Maurer	6,000	2,500	S-C-A	Cross
Crew Levick Co., Pettys Island	8,000	4,500	S-C	Doherty
Gulf Ref. Co., Bayonne	30,000	1,000	S-C	Gulf
Standard Oil Co. of N. J., Bayonne	88,000	43,000	Comp.	Modified Tube & Tank
Standard Oil Co. of N. J., Linden	75,000	160,000	Comp.	Tube & Tank
Standard Oil Co. of N. J., Jersey City	17,000	.....	L	
Tide Water Oil Co., Bayonne	50,000	22,000	Comp.	Tube & Tank and Vapor Phase
Vacuum Oil Co., Inc., Paulsboro	20,000	9,000	Comp.	Cross & Ellis
Warner-Quinlan Oil Co., Warners	20,000	.....	S-A	
Total	314.000	242,000		

NEW YORK

Sinclair Ref. Co., Wellsville	10,000	5,000	Comp.	Isom
Standard Oil Co. of N. Y., Brooklyn and Long Island City	19,000	8,000	Comp.	Cross
Standard Oil Co. of N. Y., Buffalo	5,000	2,000	Comp.	Cross
Vacuum Oil Co., Inc., Olean	6,500	3,000	Comp.	Cross & Ellis
Total	40,500	18,000		

NEW MEXICO

Continental Oil Co., Farmington	1,000	.....	S	
Continental Oil Co., Artesia	1,500	.....	S	
Continental Oil Co., Albuquerque	1,000	.....	S	
Malco Refs., Inc., Artesia	1,500	.....	S	
Pecos Diamond Ref. Co., Artesia	250	.....	S	
Valley Ref. Co., Roswell	500	.....	S	
Total	4,250			

OHIO

Allegheny-Arrow Oil Co., Canton	1,600	900	S-C	Dubbs
Gulf Ref. Co., Toledo	12,000	6,000	S-C	Gulf
Gulf Ref. Co., Cincinnati	12,000	6,000	S-C-A	Gulf
Canfield Oil Co., Cleveland	1,000	.....	L	
National Refining Co., Findlay	2,000	.....	L	
National Refining Co., Marietta	580	.....	L	
Peninsula Oil Co., Catawba Island	100	.....	S	
Pure Oil Co., Toledo	9,000	6,500	S-C	Gyro
Pure Oil Co., Heath	6,500	4,500	S-C	Gyro & Cross
Stellar Ref. Co., Marne (Newark)	1,000	250	S-C	Leamon
Standard Oil Co. of Ohio, Cleveland	20,000	8,000	Comp.	Tube & Tank
Standard Oil Co. of Ohio, Toledo	16,000	4,000	Comp.	Tube & Tank
Standard Oil Co. of Ohio, Lima	7,500	7,600	S-C	Solar Special & Cross
Sun Oil Co., Toledo	12,000	6,000	S-C	Sun
Superoil Co., Toledo	250	.....	L	
Total	101,530	49,750		

OKLAHOMA

Altitude Pet. Corp., Oklahoma City	2,500	.....	S	
Anderson-Prichard Oil Corp., Oklahoma City	6,000	3,500	S-C	Winkler-Koch
Barnsdall Refs., Inc., Okmulgee	11,000	4,500	S-C	Cross
Barnsdall Refs., Inc., Barnsdall	5,000	4,000	S-L-C	Cross
Bell Oil & Gas Co., Grandfield	4,500	1,000	S-C	Dubbs
Black Gold Ref Co., Oklahoma City	1,500	.....	S	
Century Pet. Co., Oklahoma City	3,000	.....	S	
Champlin Ref. Co., Enid	16,000	4,000	S-C-L	Cross, Winkler-Koch
Continental Oil Co., Ponca City	30,000	16,000	Comp.	Dubbs & Cross
Continental Oil Co., Sapulpa	4,000	1,500	S-C	Cross
Cushing Ref. & Gas Co., Cushing	4,500	.....	S	
Cushing Ref. & Gas Co., Blackwell	1,700	.....	S	
Deep Rock Oil Corp., Cushing	10,000	4,000	Comp.	Dubbs
Eason Oil Co., Enid	5,000	2,000	S-C	Jenkins
Empire Oil & Ref. Co., Okmulgee	4,000	1,000	S-C-L	Doherty
Empire Oil & Ref. Co., Ponca City	12,000	4,500	Comp.	Dubbs & Doherty
Garber Refs., Inc., Garber	5,000	3,000	S-C	Jenkins & Winkler-Koch
Globe Oil & Ref. Co., Blackwell	8,000	2,000	S-C	Winkler-Koch
Huckins Ref. Co., Earlsboro	500	.....	S	
Johnson Oil Ref. Co., Cleveland	6,000	2,000	S-C	Dubbs
Marathon Oil Co., Bristow	5,000	.....	S	
Marathon Oil Co., Boynton	2,500	.....	S-L	
Mid-Continent Pet. Corp., Tulsa	40,000	12,000	Comp.	Mid-Continent
Pilgrim, Inc., Ardmore	70	.....	L	
Phillips Pet. Co., Okmulgee	5,000	2,500	S-C-L	Dubbs
Producers Oil Co., Bristow	2,000	.....	S	
Producers & Refiners Corp., Tulsa	6,000	3,000	S-C	Dubbs
Pure Oil Co., Ardmore	2,500	2,400	S-C	Dubbs
Pure Oil Co., Muskogee	8,000	5,000	Comp.	Cross & Gyro
Rock Island Ref. Co., Beckett	5,000	2,000	S-C	Winkler-Koch
Sinclair Ref. Co., Sand Springs	8,000	2,500	S-C-L	Cross
Sun Oil Co., Yale	6,000	.....	S	
Sunray Oil Co., Allen	7,000	.....	S	
The Texas Company, Tulsa	15,000	18,500	S-C	Holmes-Manley & Pressure Coke
Tidal Ref. Co., Drumright	18,000	7,500	S-C	Tube & Tank, Modified Burton
Western Oil Corp., Beckett	2,000	1,200	S-C	Jenkins
Wilcox, H. F., Oil & Gas Co., Bristow	4,000	1,000	S-C	Dubbs
Wirt Franklin Pet. Corp., Ardmore	4,000	.....	S	
White Oak Corp., Allen	6,000	2,500	S-C	Jenkins
White Oak Corp., Oklahoma City (plant owned by Gulf States Oil Corp.)	4,500	.....	S	
Yale Oil Corp., Yale	2,000	.....	S	
Total	292,700	113,100		

PENNSYLVANIA

Atlantic Ref. Co., Philadelphia	50,000	32,600	Comp.	Lewis, Cross & DeFlorez
Atlantic Ref. Co., Franklin	9,000	6,000	Comp.	Cross
Atlantic Ref. Co., Pittsburgh	8,000	4,000	Comp.	Cross
Bradford Oil Ref. Co., Bradford	1,200	.....	L-S	
Canfield Oil Co., Coraopolis	1,000	.....	S-L	
Carnegie Ref. Co., Carnegie	1,000	.....	S-L	
Continental Ref. Co., Oil City	1,500	*2,500	S-C	Dubbs
Conewango Ref. Co., North Warren	2,000	.....	S-L	
Conewango Ref. Co., North Warren	2,000	.....	S	
Crew-Levick Co., Titusville	3,000	.....	S-L	
Crystal Oil Works, Rouseville	1,000	.....	S-L	
Daugherty, W. H., & Son Ref. Co., Petrolia	2,000	.....	S-L	
Franklin Creek Ref. Co., Franklin	1,000	.....	S-L	
Freedom Oil Works Co., Freedom	2,000	.....	S-L	
Gulf Ref. Co., Philadelphia	32,000	19,000	Comp.	Gulf
Gulf Ref. Co., Pittsburgh	6,000	3,000	S-C	Gulf
Kendall Ref. Co., Bradford	3,500	2,500	Comp.	Dubbs
Miller, A. D., Sons Co., Pittsburgh	1,000	500	S-L	Miller
Pennsylvania Oil Products Co., Eldred	1,000	1,000	S-C-L	Conerty
Pennsylvania Ref. Co., Karns City	2,000	.....	S-L	
Pennsylvania Ref. Co., Titusville	1,200	.....	S-L	
Pennzoil Co., The, Rouseville	8.000	4,500	Comp.	Dubbs
Pure Oil Co., Marcus Hook	20,000	15,000	S-C	Cross & Gyro
Pure Penn Ref. Co., Clarendon	350	.....	S-L	
Quaker State Oil Ref. Corp. (formerly McKean County Ref. Co.), Bradford	2,500	.....	S-L	
Quaker State Oil Ref. Corp. (formerly Emlenton Ref. Co.)	2,000	2,000	Comp.	Dubbs
Quaker State Oil Ref. Corp. (formerly Independent Ref. Co.), Oil City	2,000	.....	S-L	
Sherwood Ref. Co., Warren	750	.....	S-L	
Sinclair Ref. Co., Marcus Hook	20,000	10,000	S-C	Isom
Superior Oil Works, Warren	500	.....	S-L	
Starlight Ref. Co., Karns City	300	.....	L	
Sun Oil Co., Marcus Hook	40,000	12,000	Comp.	Sun
The Texas Company, Marcus Hook	1,500	.....	A	
Tiona Ref. Co.				
Ultra-Penn Ref. Co., Butler	1,000	800	S-C-L	Snodgrass
United Ref. Co., Warren	1,500	.....	S-L	
Valvoline Oil Co., Butler	3,000	.....	S-L	
Valvoline Oil Co., Warren	1,500	.....	S-L	
Waverly Oil Works Co., Pittsburgh	1,000	.....	S-L	
Wolverine-Empire Ref. Co., Reno	1,000	.....	S-L	
Wolverine-Empire Ref. Co., Tidioute	800	.....	S-L	
Total	239,100	115,400		

*Cracking plant owned jointly by Pennzoil Co., Quaker State Oil Ref. Co., Wolverine Empire Ref. Co. and Continental Ref. Co.

RHODE ISLAND

Standard Oil Co. of N. Y., Inc., Providence	10,000	6,000	S-C-A	Cross
The Texas Company, Providence	1,500	.....	A	
Total	11,500	6,000		

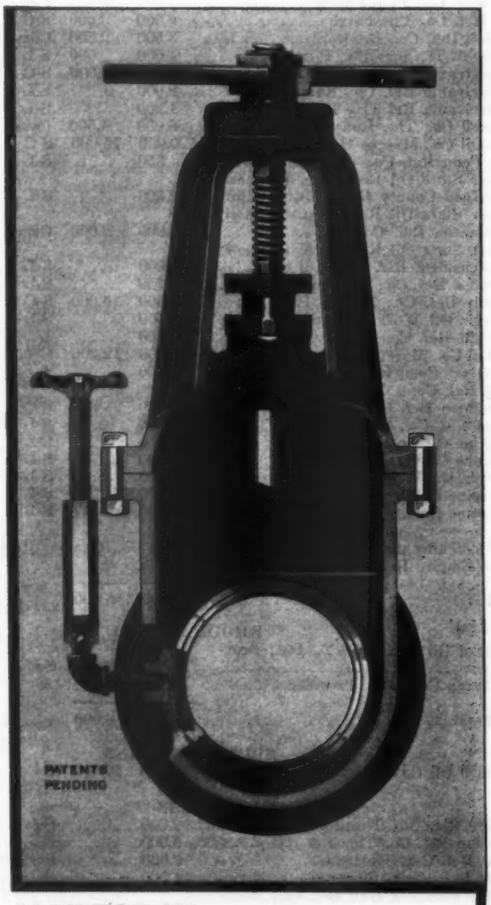
SOUTH CAROLINA

Standard Oil Co. of N. J., Charleston	15,000	20,500	S-C-A	Tube & Tank

TEXAS

Allstate Ref. Co., Thrall	2,500	.....	S	
American Pet. Co., Houston	4,000	.....	S	
Arrow Ref. Co., Overton	2,500	.....	S	
Archer Ref. Corp., Megargel	1,500	.....	S	
Atlantic Pacific & Gulf Ref. Co., Wichita Falls	3,000	2,500	S-C	Jenkins
Beacon Oil & Ref. Co., Henderson	2,500	.....	S	
Bluebonnett Oil Ref. Co., Wickett	5,000	.....	S	
Boone Ref. Co., Arp	1,500	.....	S	
Burford Oil Co., Pecos	6,000	5,000	S-C	Jenkins
Carson, M. D., Brady	250	.....	S	
Conroe Oil & Ref. Co., Conroe	250	.....	S	
Continental Oil Co., Wichita Falls	6,000	2,000	S-C	Continental
Cosden Oil Co., Big Spring	10,000	10,000	S-C	Jenkins
Col-Tex Ref. Co., Colorado	10,000	3,600	S-C	Richmond
Crescent Oil & Ref. Co., Houston	1,000	.....	S	
Crown Central Pet. Corp., Houston	8,000	6,000	S-C	Holmes-Manley
Deepwater Oil Refs., Inc., Houston	3,000	.....	S-L	
Diamond Ref. Co., Overton	2,500	.....	S	
Dixon Creek Oil & Ref. Co., Kings Mill	4,000	.....	S	
East Texas Ref. Co., Henderson	5,000	.....	S	
East Texas Ref. Co., Longview	10,000	3,000	S-C	East Texas
Empire Oil & Ref. Co., Gainesville	4,000	2,000	S-C	Dubbs
Exchange Pet. Co., Albany	500	.....	S	
Falls Ref. Co., Wichita Falls	2,500	.....	S	
Grayburg Oil Co., San Antonio	2,500	1,000	S-C	Dubbs
Gladetex Ref. Co., Gladewater	500	.....	S	
Gladewater Ref. Co., Gladewater	500	.....	S	
Gulf Ref. Co., Port Arthur	125,000	50,000	Comp.	Gulf
Gulf Ref. Co., Fort Worth	6,000	3,000	S-C	Gulf
Gulf Ref. Co., Sweetwater	5,000	4,000	S-C	Gulf

NEW LUBRICATING FEATURE BIGGEST IMPROVEMENT IN TWENTY-FIVE YEARS



TIGHTER SEATING, EASIER OPERATION, LESS MAINTENANCE AND LONGER LIFE

This new principle in gate valves was originally developed for one of the large refineries. This refinery had tried gate valves of many different makes, but found that ordinary valves would last but a few weeks. After a short time, however, leaks would develop.

Lubrotite Gate Valves were installed. After many months of service under the hardest possible operating conditions, these valves today are performing as well as the day they were put into service.

In the Reading-Pratt & Cady Lubrotite Gate Valves, a lubricant is introduced under pressure between the disc and seats. This thin film of special lubricant protects the seats and the valve stays tight so long as the melting point of the lubricant-seal is not exceeded.

Where foreign materials scratch the seats and cause the ordinary gate valve to leak, the Lubrotite Lubricant seals such leaks and prevents them from becoming larger. Where line conditions are such that it is necessary to take the ordinary valve apart in order to clean the seating surfaces, Lubrotite Valves remain tight.

Lubrotite Gate Valves open easier. Sticking is prevented by screwing down the lubricating guns a turn or two as the valve is being closed. Also, a turn of the guns will free a valve which has become stuck after being closed for a long time.

The Lubrotite feature is available in several Reading-Pratt & Cady Gate Valves. Tell us what your operating conditions are. Our engineers are at your service. The coupon at the left is provided for your convenience—fill in and mail today.

ACCO

An Associate Company of the American Chain Company, Inc.

MAIL TODAY for Complete Information

READING-PRATT & CADY CO., *Inc.*
Bridgeport, Conn.

Please send by return mail, without any obligation whatever, complete facts about "Lubrotite" Gate Valves.

Company.....

Address.....

Name and Position.....

.....

Lubrotite

IRON & STEEL GATE VALVES

MADE BY **READING-PRATT & CADY, *Inc.***

Survey of Operating Refineries By States

TEXAS (Continued)

Company and plant location—	Crude oil cap.	Crack. cap.	Type of refinery	Type of cracking plant
Houston Oil Co. of Texas, Viola	1,000	.....	S	
Howard County Ref. Co., Big Spring	1,800	.....	S	
Humble Oil & Ref. Co., Ingleside	15,000	25,000	S-C	Tube & Tank
Humble Oil & Ref. Co., Baytown	125,000	170,000	Comp.	Tube & Tank and Cross
Humble Oil & Ref. Co., San Antonio	4,500	.....	S-A	
Humble Oil & Ref. Co., McCamey	15,000	25,000	S-C	Tube & Tank
Humble Oil & Ref. Co., Chilton	4,500	.....	S	
Humble Oil & Ref. Co., Neches	5,000	.....	S	
Kilgore Ref. Co., Kilgore	1,500	.....	S	
Master Pet. Co., Waco	600	.....	S	
Magnolia Pet. Co., Beaumont	70,000	55,000	Comp.	Cross
Magnolia Pet. Co., Fort Worth No. 1	4,500	3,000	S-A	Cross
Magnolia Pet. Co., Fort Worth No. 2	2,600	750	S-A	Controlled Coil
Magnolia Pet. Co., Corsicana	4,000	.....	S	
Magnolia Pet. Co., Luling	5,000	3,750	S-C	Controlled Coil
Marathon Oil Co., Fort Worth	5,000	.....	S-L	
Marathon Oil Co., Del Rio	3,000	.....	S	
Misko Refs., Inc., Laredo	1,200	1,500	S-C-L	Misko
Montana Oil & Ref. Co., Arno	1,000	.....	S	
Muenster Ref. Co., Muenster	300	.....	S	
Octane Oil Ref. Co., Baird	1,500	1,000	S-C	Dayson
Olney Oil & Ref. Co., Olney	2,500	.....	S	
Oriental Oil Co., Dallas	4,500	.....	S	
Overton Ref. Co., Overton	4,000	.....	S	
Panhandle Ref. Co., Wichita Falls	5,000	1,500	S-C	Dubbs
Pasotex Pet. Co., El Paso	14,000	4,000	S-C	Dubbs
Phoenix Ref. Co., Pettus	600	.....	S	
Phoenix Ref. Co., Inc., Dallas	1,000	.....	S	
Petroleum Refractionating Corp., Pampa	6,500	.....	S	
Phillips Pet. Co., Borger	25,000	7,500	S-C	Phillips
Pioneer Oil & Ref. Co., Somerset	2,000	.....	S	
Pure Oil So., Smiths Bluff (Nederland)	30,000	20,000	Comp.	Gyro, Cross
Republic Oil Ref. Co., Texas City	5,000	3,000	S-C	Winkler-Koch
Rio Grande Oil Co., El Paso	3,500	.....	S	
San Angelo Ref. Co., San Angelo	2,000	.....	S	
Shell Pet. Corp., Houston, Tex.	25,000	12,000	S-C	Dubbs
Simms Oil Co., Dallas	4,500	2,400	S-C	Cross
Sinclair Ref. Co., Camp Switch (near Gladewater)	1,500	.....	S	
Sinclair Ref. Co., Houston	31,000	25,000	S-C	Isom
Sinclair Refining Co., Fort Worth	4,000	.....	S	
Southern Oil & Ref. Co., Kilgore	2,500	.....	S	
Star Ref. & Prod. Co., Fort Worth	1,500	300	S-C	Fleming
Stone Oil Co., Texas City	5,000	2,000	S-C	Jenkins
Taylor Ref. Co., Tyler	15,000	10,000	S-C	Rowsey
Taylor Ref. Co., Taylor	5,000	3,000	S-C	Rowsey
The Texas Company, Port Arthur	60,000	96,000	Comp.	Holmes-Manley, DeFlorez, Pressure Coke
The Texas Company, West Dallas	16,000	9,600	S-C	Holmes-Manley, DeFlorez, Pressure Coke
The Texas Company, Amarillo	4,000	3,200	S-C	Pressure Coke, DeFlorez
The Texas Company, Port Neches	20,000	.....	A	
The Texas Company, Houston	20,000	1,000	S-C	Tube & Tank
The Texas Company, San Antonio	3,000	3,000	S-C	Holmes-Manley
The Texas Company, El Paso	1,500	1,500	S-C	Holmes-Manley
Texas Mexican Oil & Ref. Co., Laredo	600	.....	S	
Texas Pacific Coal & Oil Co., Fort Worth	3,000	1,000	S-C-L	Cross
Texas Pacific Coal & Oil Co., Caddo	1,000	.....	S	
Texas Pet. Products Co., Somerset	2,000	.....	S	
V.O.E. Ref. Co., Gladewater	500	.....	S	
Waggoner Ref. Co., Electra	4,500	2,000	S-C	Waggoner
Wickett Ref. Co., Wickett	2,000	.....	S	
Total	845,700	594,000		

UTAH

Diamond Oil Co., Virgin City	500	.....	S	
Jenson Oil Ref. Co., Ogden	*1,000	.....	S	
Utah Oil Ref. Co., Salt Lake City	6,500	8,900	Comp.	Modified Burton, Holmes-Manley
Total	8,000	8,900		

*Company states crude capacity to be increased to 3,000 bbls.

VIRGINIA

The Texas Company, Norfolk	1,500	.....	A	

WEST VIRGINIA

Carbide & Carbon Chemicals Corp., South Charleston	1,000	1,000	S-C	Gyro
Elk Ref. Co., Falling Rock	2,000	.....	S-L	
Ohio Valley Ref. Co., St. Marys	2,000	750	Comp.	Dubbs
Pure Oil Co., Cabin Creek	3,500	1,500	S-L-C	Gyro
Standard Oil Co. of N. J., Charleston	5,000	18,900	Comp.	Tube & Tank
Tri-State Ref. Co., Kenova	2,500	1,800	S-C	Jenkins
Total	16,000	23,950		

WYOMING

Continental Oil Co., Glenrock	4,000	*3,000	S-C	Burton
Goshen Oil Ref. Co., Torrington	250	.....	S	
Gillette Ref. Co., Gillette, Wyo.	100	.....	S	
White Eagle Oil Corp., Casper	6,000	6,000	S-C	White Eagle
Midland Oil Ref. Co., Osage	300	.....	S	
Midwest Ref. Co., Casper	38,000	†17,850	Comp.	Burton
Midwest Ref. Co., Greybull	5,000	†2,500	S-C	Burton
Midwest Ref. Co., Laramie	5,000	†3,000	S-C	Burton
Producers & Refiners Corp., Parco	8,000	4,000	S-L-C	Dubbs
The Texas Company, Casper	7,000	6,500	S-C	Holmes-Manley, Pressure Coke
The Texas Company, LaBarge	300	.....	S	
Wyoming Gas & Oil Co., Upton	100	.....	S	
Total	74,050	42,850		

*Cracking units operated by Standard Oil Co. (Indiana). †Additional cracking capacity designed by Standard of Indiana under construction. All Midwest refineries operated by Standard of Indiana.

LARGE INCREASE IN 1931 IN GULF COAST TANKER SHIPMENTS

(Continued from Page 113)

WATER SHIPMENTS, GULF COAST PORTS

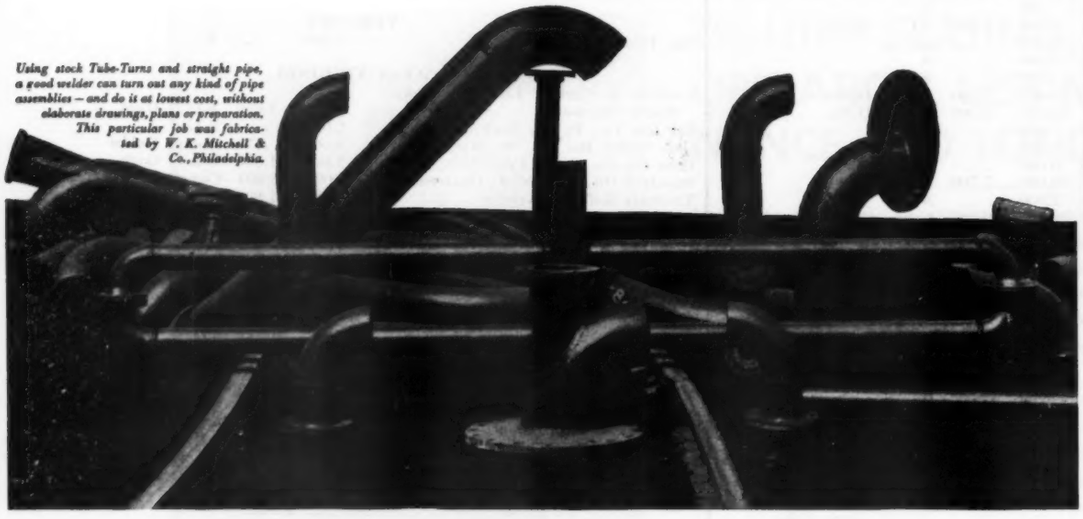
Crude Oil

Company, port, and destination—	January (bbls.)	February (bbls.)	March (bbls.)	April (bbls.)	May (bbls.)	June (bbls.)	July (bbls.)	August (bbls.)	September (bbls.)	October (bbls.)	November (bbls.)	December (bbls.)	Total (bbls.)
Atlantic O. P. Co., Atreco, coastwise	988,529	956,487	1,091,725	693,162	766,138	879,423	582,048	.....	.....	971,549	879,724	961,904	8,769,689
Atlantic O. P. Co., Beaumont, coastwise	.....	80,003	78,215	.....	.....	.....	77,946	58,132	.....	.....	.....	.....	294,296
Gulf Ref. Co., Port Arthur, coastwise	277,387	249,616	247,398	135,250	297,141	266,817	398,446	228,439	331,969	199,297	116,451	195,048	2,943,259
Humble O. & R. Co., Baytown, coastwise	109,004	79,756	112,326	117,290	405,811	191,463	270,331	229,780	285,289	187,690	177,128	89,704	2,255,572
Humble O. & R. Co., Harbor Is., coastw.	1,555,395	1,693,955	1,995,425	1,700,436	2,764,076	2,099,217	1,950,395	2,021,957	1,959,162	2,414,242	2,134,699	1,993,304	24,282,363
Humble O. & R. Co., Ingleside, coastwise	167,658	66,676	246,235	167,308	182,476	169,016	134,056	67,462	67,360	133,890	134,450	163,277	1,699,859
Humble O. & R. Co., Ingleside, export	.....	.....	.....	.....	.....	.....	.....	1,028	.....	.....	.....	.....	1,028
Humble O. & R. Co., Neches, coastwise	.....	74,413	.....	.....	77,086	.....	75,566	.....	70,301	.....	.....	.....	297,366
Humble O. & R. Co., Texas City, coastw.	473,314	533,582	409,326	202,034	651,721	370,051	374,425	616,373	584,764	395,489	484,624	467,414	5,563,117
Magnolia Pet. Co., Beaumont, coast.-exp.	625,547	772,541	636,621	745,573	564,290	735,039	708,034	414,448	665,356	712,524	319,691	353,222	7,252,896
Pure Oil Co., Smith's Bluff, coastwise	769,138	277,184	444,767	207,358	206,834	479,413	171,651	917,798	631,778	286,057	436,791	428,203	5,250,972
Pure Oil Co., Smith's Bluff, export	.....	.....	.....	.....	.....	.....	.....	.....	.....	162,137	.....	.....	162,137
Standard of La., Baton Rouge, coastwise	118,836	139,741	139,242	109,434	167,272	280,841	116,808	469,322	333,206	109,509	317,268	417,736	2,719,215
Standard of La., Baton Rouge, export	.....	71,021	52,203	124,636	.....	80,036	80,038	79,330	19,565	161,918	.....	20,493	689,230
Sun Oil Co., Sabine Pass, coastwise	1,204,650	.....	1,006,649	929,354	1,404,626	.....	2,178,764	1,182,021	1,361,797	943,886	1,229,226	1,253,925	12,695,938
The Texas Co., Port Arthur, coastwise	284,879	374,323	285,312	194,217	255,998	884,978	793,272	554,617	363,788	1,117,254	964,067	6,764,416	12,737,021
The Texas Co., Port Arthur, export	.....	72,490	.....	72,436	149,524	154,987	226,711	454,509	617,306	601,136	346,175	20,493	2,715,067
Total 1931	6,579,362	5,241,788	6,745,454	5,398,488	7,893,293	6,685,271	8,132,491	7,296,116	7,291,641	8,396,678	7,539,304	13,134,139	90,334,025
Total 1930	6,352,027	6,257,134	7,874,227	6,896,076	8,359,414	6,961,980	6,897,223	7,996,139	7,547,963	5,417,152	6,497,596	8,102,471	85,159,402
Difference	335	915,246	1,128,773	1,497,588	466,121	276,709	1,235,268	700,023	256,322	2,979,526	981,708	5,031,668	5,174,652

Refined Products

Company, port, and destination—	January (bbls.)	February (bbls.)	March (bbls.)	April (bbls.)	May (bbls.)	June (bbls.)	July (bbls.)	August (bbls.)	September (bbls.)	October (bbls.)	November (bbls.)	December (bbls.)	Total (bbls.)
Atlantic O. P. Co., Atreco, coastwise	.....	.....	.....	30,513	.....	20,744	23,704	695,787	339,865	37,089	6,087	.....	1,843,789
Gulf Ref. Co., Port Arthur, coastwise	2,414,637	1,932,040	1,989,208	2,348,922	2,129,043	2,345,975	2,021,429	2,121,944	2,246,999	2,182,644	1,737,227	2,190,589	25,851,257
Gulf Ref. Co., Port Arthur, export	261,595	66,746	143,277	123,145	69,989	153,836	219,072	201,585	229,735	.....	187,184	235,426	1,891,591
Humble O. & R. Co., Baytown, coastwise	1,039,128	1,117,911	1,275,369	1,413,215	1,397,943	1,412,633	1,286,771	1,161,342	1,891,168	1,689,731	846,239	1,097,141	15,128,591
Humble O. & R. Co., Baytown, export	1,507,657	1,502,213	1,384,967	1,600,324	1,239,764	868,407	1,219,936	1,351,379	1,090,209	1,106,166	1,540,224	1,095,246	15,507,092
Magnolia Pet. Co., Beaumont, coast.-exp.	2,365,108	1,535,415	1,831,454	1,642,963	1,787,721	1,551,168	1,493,166	2,184,851	1,905,044	2,564,895	1,802,048	1,907,098	22,570,931
Pure Oil Co., Smith's Bluff, coastwise	395,841	323,475	314,404	333,683	547,590	369,464	324,892	519,506	475,244	569,134	573,964	433,445	5,730,742
Pure Oil Co., Smith's Bluff, export	.....	149,310	162,254	45,544	80,416	68,441	.....	.....	43,787	43,866	59,546	.....	653,664
Standard of La., Baton Rouge, coastwise	964,192	817,001	1,144,851	561,514	595,527	837,651	1,148,086	771,321	713,093	227,202	658,144	445,491	8,884,078
Standard of La., Baton Rouge, export	863,028	415,151	495,386	246,923	785,217	882,884	678,951	712,723	781,591	838,070	657,749	847,033	8,204,706
The Texas Co., Port Arthur, coastwise	945,167	1,406,417	1,460,730	1,277,545	1,446,937	1,244,731	1,203,297	724,501	1,342,170	1,002,123	1,079,222	1,510,057	14,743,897
The Texas Co., Port Arthur, export	534,777	525,261	261,895	742,265	471,041	449,377	462,108	471,946	421,287	1,018,106	373,791	905,605	6,637,399
Total 1931	11,291,040	9,791,380	10,463,795	10,367,055	10,551,188	10,205,312	10,681,412	10,916,885	11,481,297	11,269,016	9,512,025	10,707,232	127,237,637
Total 1930	11,307,250	11,212,960	12,437,101	11,568,771	10,623,907	11,492,920	10,609,393	11,110,484	10,384,288	9,086,779	8,067,349	8,822,643	127,222,849
Difference	516,210	1,421,580	1,973,306	1,201,716	71,719	1,287,608	72,019	193,599	1,097,009	2,182,237	1,444,688	1,884,588	14,824

Save on FABRICATING? *why,* ABSOLUTELY!



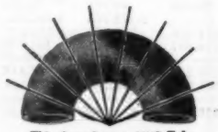
Using stock Tube-Turns and straight pipe, a good welder can turn out any kind of pipe assemblies — and do it at lowest cost, without elaborate drawings, plans or preparation. This particular job was fabricated by W. K. Mitchell & Co., Philadelphia.

Any contractor or fabricator who really figures costs, will find that he can save more money by welding with Tube-Turns than by trying to economize with bends, mitres or other home-made fittings.

There's no use fooling ourselves. Nobody profits by taking a job at today's prices, then running it through every hoist, bending table, heater, etc. in the shop just "to get the use of the equipment". Them days is gone forever! The only way to profit these days is to get the job *out*, as fast as possible. Home-made fittings waste too much time, labor and materials.

In addition to 90° elbows, Tube-Turns are also made in 45° and 180° types — a complete line. Sizes range from ¾" through 20". Standard and Extra-Heavy weights are both stock.

All Tube-Turns have uniform wall-thickness at all points; no thinning or thickening; no seams; they line up perfectly with the pipe in both O. D. and I. D. Therefore easier to weld into the line, with less labor, gas and rod.



This shows how a 180° Tube-Turn can be cut, straight across, to form any kind of odd-angle turn. Makes offsets, compounds and "specials" absolutely easy for any good welder. (Write for photographs of a few examples.)

For this reason, many of the nation's most successful contractors and fabricators are using Tube-Turns more and more all the time. If you are interested in reducing your fabricating costs, in the shop *or in the field,* write for further facts. No obligation, of course. *Address:* TUBE-TURNS, *Incorporated,* 1311 South Shelby Street, Louisville, Kentucky.

TUBE-TURNS

The name Tube-Turn applies ONLY to the original, genuine products manufactured by Tube-Turns, Incorporated

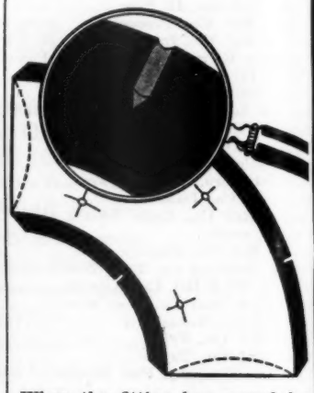
SAFETY-DRILLED TUBE-TURNS Now Available

Especially Applicable to Refinery Piping

In order to reduce the hazard of failure due to corrosion and erosion in fittings used in stills, condensers, economizers — in charging, transfer and vapor lines, etc.— Tube-Turns, Incorporated, now offers Safety-Drilled Tube-Turns

What They Are

Safety-Drilled Tube-Turns are genuine Tube-Turns, drilled at carefully-calculated intervals around the periphery of the fitting, to a depth determined by the operating conditions under which the fitting is to be used.



When the fitting has corroded or eroded to the point where the wall-thickness is reduced to anything approximating its safe limit, one or more of these holes is exposed and a small leakage occurs, warning the operator that the fitting should be replaced.

A Scientific System

During the past several years, thorough study and research have been given to the various factors that influence the dependability of pre-drilling as a safety measure. It has been found, for instance, that the size and shape of the holes, and their position and number are of great importance. All these findings are incorporated in Safety-Drilled Tube-Turns. The size, placement and depth of the drillings vary in virtually every size, and in the different types (45°, 90° and 180°). In every case, however, Safety-Drilled Tube-Turns withstand the same high bursting pressures as undrilled, or regular, Tube-Turns.

Investigate this Effective, Economical Safety Measure

Safety-Drilled Tube-Turns are furnished in both elbow and return bend types, in all sizes and weights, either with or without flanges. Write today for information and prices. No obligation. **Address:** Tube-Turns, Incorporated, 1311 S. Shelby St., Louisville, Ky.

NEW DEVELOPMENTS IN LABORATORY CONTROL

(Continued from Page 69)

sure." On the average no more than 30 minutes of an operator's time are required per distillation. The entering of the sample and the final vaporization of the last traces of a gas sample or withdrawal and measurement of liquid residue, of course, demand the attention of the operator. However, the entering of a gas sample is semiautomatic. At the end of the distillation, the printed chart is torn off as a complete record and percentages determined directly from the curve thereon. Figure 4 shows a typical chart record. A complete description of the construction and functioning of the automatic parts are beyond the scope of this article, and will be given in a later article.

The accuracy and dependability of this automatic mechanism is considerably superior to even the most skilled manual operator. Typical check runs are shown in Table 2. Considering the number of functions performed, the automat is simple in design, and has only a very few adjustments. The average operator can very readily understand its operation and can usually take care himself of all servicing and minor repairs.

It is expected that the automat will find numerous practical applications as distinguished from manual operation of the low-temperature fractionating apparatus. The most important advantage to be derived from its use is that of ultimate and final standardization of the analytical procedure in terms of size and kind of sample, instructions on relatively simple functions, such as preparing apparatus, adjusting automat, commencing and completing distillations, and interpretation of the printed fractional distillation curve. The printed curve is unbiassed, includes a check on the functioning of the distillation control in the form of a distillation time rate curve, and is in ideal form for inspection and criticism and for future reference. In other words the curve tells the whole story and even reveals the possible poor functioning of the automat due to improper adjustments or other troubles. Analyses run on the same sample in different laboratories by different operators but with same automat adjustments should yield almost identical curves. Use of the automat in referee and legal work is strongly indicated. The saving of operator's time is of course material, and may be utilized either by having the operator do other work while the automat is functioning or by having one operator attend several apparatus simultaneously.

In order to mechanize the operation of a low temperature fractionating apparatus, it is essential to use a method of reflux cooling almost instantaneously responsive such as that provided with the Precision and Standard Precision columns already described[3]. A gasoline or other liquid bath in the reflux is too sluggish for the purpose. Aside from this, no other requirements are involved, except that, of course, the automat is limited by the inherent fractionating efficiency of the column used.

Comparative tests with the Regular type (liquid reflux bath), Precision type and Standard Precision columns (dry packing) using the same size and composition sample and the same automat adjustments have shown that the Precision and Standard Precision columns are materially superior in fractionating efficiency to the Regular or other types of liquid bath column. The Standard Precision column is somewhat more efficient than the Precision column, due mainly to the superior thermal insulation of the metal reflector. Unsilvered columns give poor results.

TABLE 2—TYPICAL CHECK ANALYSES WITH AUTOMATIC CONTROL AND RECORDING APPARATUS

	Automatic operation		Manual operation
	First run	Second run	
Methane and lighter	64.99	64.95	65.1
Ethane	16.60	16.53	16.7
Propane	11.53	11.44	11.5
Iso-butane	1.14	1.18	1.0
N-butane	2.93	3.05	2.9
Pentanes	1.51	1.60	
	} 2.81	} 2.85	} 2.8
Hexanes and heavier	1.30	1.25	
	100.00	100.00	100.0

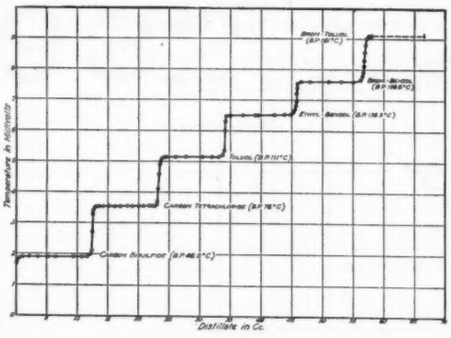


Figure 6. Curve for High-Temperature Fractionation of Synthetic Mixture.

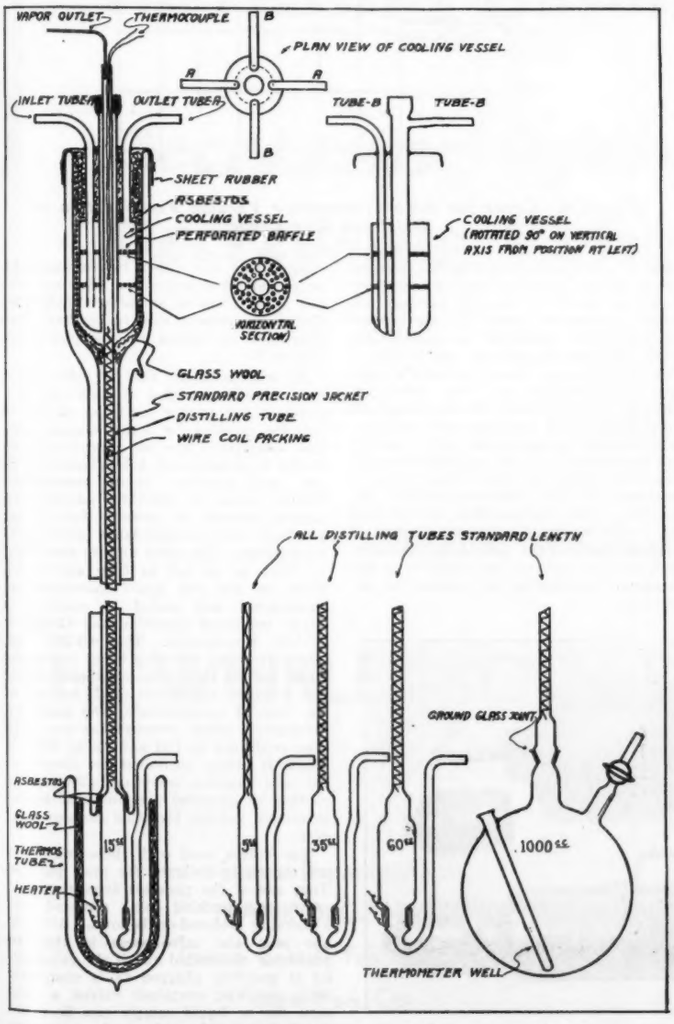


Figure 2. Standard Precision Column with Interchangeable Distilling Tubes.

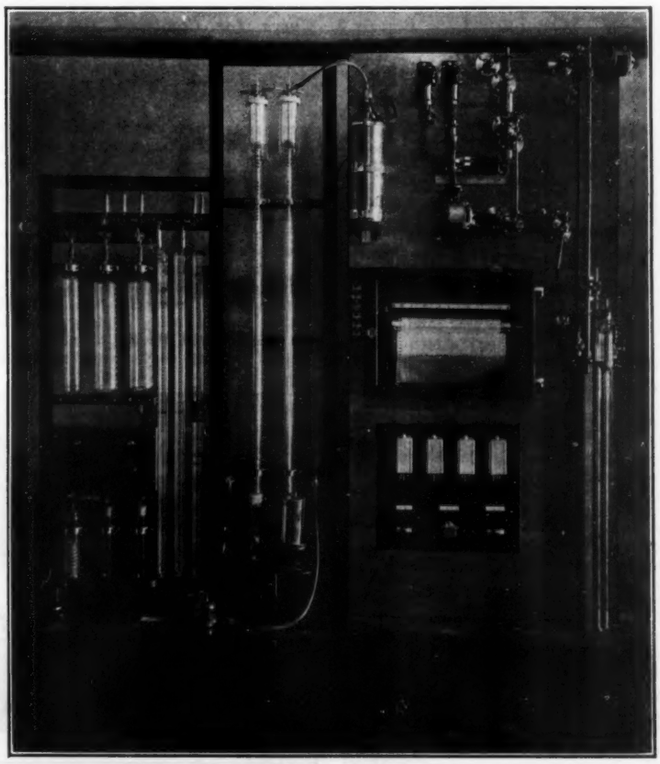


Figure 3. Automatic Control and Recording Apparatus Operating Standard Precision Model.

—o-O-o—

Podbielniak High-Temperature Fractionating Apparatus

Precise fractional distillation analysis of petroleum and its numerous products such as motor fuel, kerosene, gas oil, lubricating oils, etc., is of great importance to the refiner as it gives him the essential data necessary for the efficient design and control of his equipment. While in the case of the higher boiling fractions of petroleum it is no longer possible to determine individual hydrocarbon components, it is still essential to obtain a true boiling point curve with

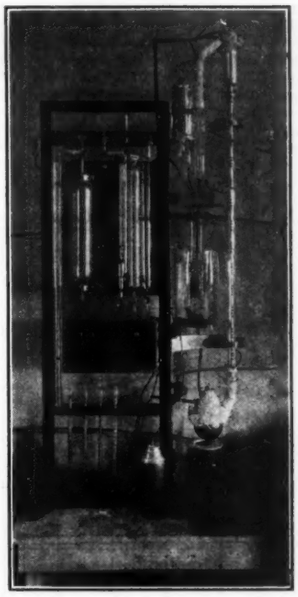


Figure 5. Podbielniak High-Temperature Fractionating Apparatus.

materially greater fractionation efficiency than that attained in the most efficient commercial fractionating tower. Such true boiling point curve analyses of the various products entering and leaving equipment make possible the computation of close material balances for close-cut fractions in the case of noncracking processes, and in the case of cracking processes furnish exact information on the amount of chemical transformation accomplished by the cracking.

However, as pointed out by W. K. Lewis[2], there has not been available laboratory distilling apparatus to compare with the modern commercial rectifying tower in fractionating efficiency, except in the case of the low-temperature fractionating apparatus already mentioned, with its limitation to the distillation of compounds of boiling point not exceeding about 100° C. The chief difficulties in the design of precise laboratory distilling apparatus for higher thermal ranges have been high heat loss from the column through all available insulations, excess holdup of liquid in column packing, errors in reading vapor temperature with a thermometer, loss of uncondensed volatile vapors, etc. It is believed that these and other difficulties are solved by the development of the apparatus (United States and foreign patent applications pending) shown in the photograph, Figure 5.

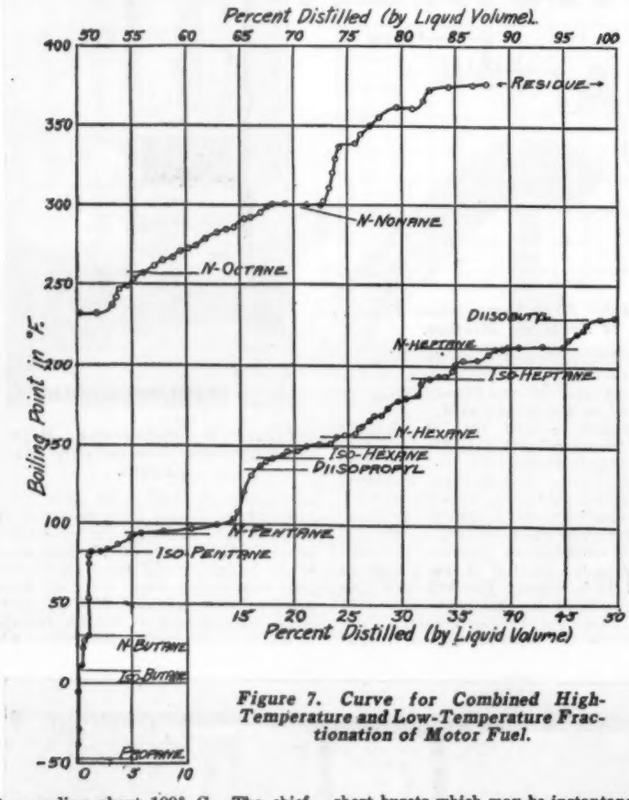


Figure 7. Curve for Combined High-Temperature and Low-Temperature Fractionation of Motor Fuel.

The outstanding feature of this apparatus is its superior fractionating efficiency as shown in the fractional distillation curves, Figures 6, 7 and 8, representing single distillations without rerunning of fractions. In the case of the heavier fractions of motor fuel (Figure 7) and petroleum crude (Figure 8) the curves show positive indication of fractions of distinctive boiling points even at temperatures above 400° F., although, due to our very limited knowledge of the composition of petroleum, their chemical nature is not known at present. Compounds boiling as little as 11° F. apart can be quantitatively determined from each other when desired.

As in the case of the low-temperature apparatus, the fractionating column itself is of major importance. The high-temperature column is generally similar to the low-temperature column in that it has a sleeve-type vacuum jacket and a variety of interchangeable distilling tubes. However, the metal reflector in the vacuum jacket is especially constructed to give the very high thermal insulation required at higher temperatures up to 500° or 600° F. Also the construction of the jacket itself is adapted to take care of the very appreciable differential expansion between the inner and outer tubes of the jackets at the higher temperatures. The distilling tubes used are of various diameters depending on their purpose but preferably packed with the wire coil packing of proven efficiency as used in the low-temperature apparatus. Samples of size ranging from as little as 15 cc. to 1,000 cc. or more may be distilled, with only a change of distilling tube using the same vacuum jacket.

Other features include an improved method of collecting liquid distillate in short burets which may be instantaneously replaced with "empties" by means of a special change block without losing vacuum; a special glass trap using a dry-ice acetone bath to condense and drain back to the receiver any volatile vapors escaping past the condenser; improved reflux cooling arrangement suitable for use with any refrigerant such as liquid air, liquid carbon dioxide, water, or compressed air; a novel means of precise vacuum control, using a glass vessel in which the desired distillation pressure is obtained (adjustable for any value from 760 mm. to 1 or 2 mm.) and a "null-point" balancing manometer with electrical contact to vacuum pump to keep column pressure balanced against the standard pressure in the glass vessel; and a large capacity buret for the collection and measurement of noncondensible gases from distillation.

The apparatus may be applied to the analysis by precise fractionation of a great variety of liquid products up to 500° F. or higher actual reflux temperature and at pressures from atmospheric down to about 3 mm. of mercury absolute pressure or lower. It may be used to very good advantage in combination with the low-temperature apparatus as the same vacuum pump and millivoltmeter is suitable for use with either apparatus. The facilities for obtaining and storing liquid air necessary with the low-temperature apparatus may often be used advantageously for the determination of dissolved gases in liquid samples to be analyzed in the high-temperature apparatus. The combination of the two apparatus covers an enormous amount of applications in the petroleum industry ranging from general gas analysis to the testing of lubricating oil content of petroleum.

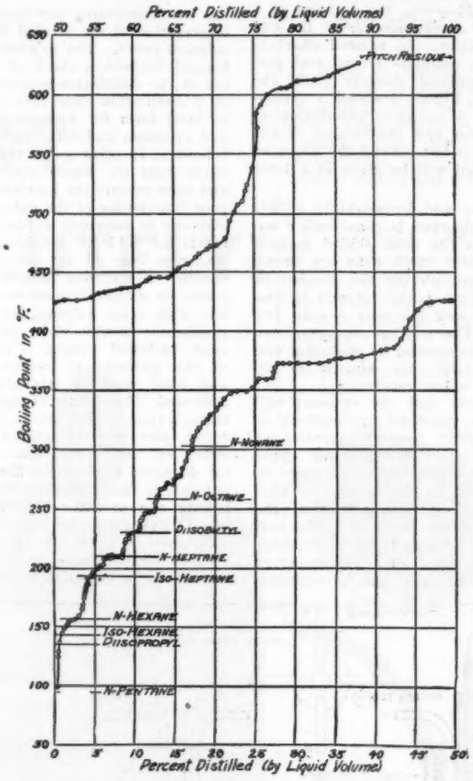


Figure 8. Curve for High-Temperature Vacuum Fractionation of Oklahoma City Crude.

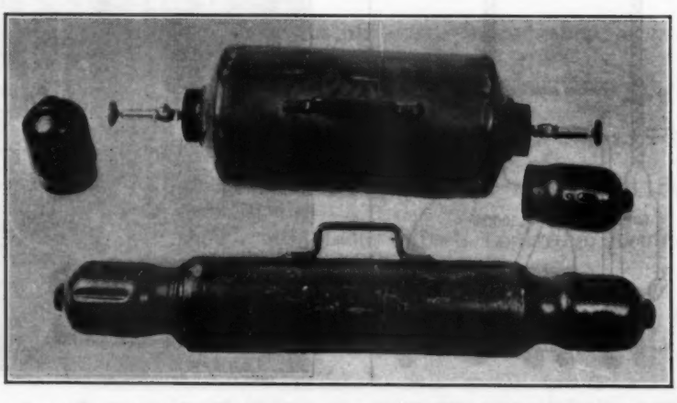


Figure 9. Standardized Gas and Gasoline Sample Containers.

Standardized Sample Containers and Valves

Running precise analyses with non-representative samples of any kind is worse than no analysis at all since the results may be highly misleading. It is therefore essential to use the greatest care in taking samples. This is especially true in the case of such products as gas or volatile gasoline which are extremely difficult to sample without change of composition due either to contamination or to partial vaporization. For use with the latter class of samples, standardized sample containers and valves have been developed as shown in the photograph Figure 9.

It will be noted that a valve nipple and valve is provided at each end as is required for proper sampling of gas or volatile gasoline by water displacement. The containers are of approximate capacity 5 gallons and 1.5 gallons for the gas and gasoline types respectively. Fusible plugs are provided against dangerous increase in pressure due to temperature rise in accordance with I.C.C. regulations. The valve nipples are brazed in flush so as not to trap any water. Both the gas and liquid containers are constructed and tested to conform to I.C.C. container specifications 4B-300 or 4C-116 respectively. The 4B-300 container requires retesting every five years while the 4C-116 container requires only the original inspection and testing at the time of manufacture. The maximum permissible rated pressure for the latter type container is 116 pounds at 100° F. which is amply sufficient for almost all gas and gasoline sampling with the exception of liquefied propane and similar extremely volatile liquefied gaseous products.

The valves used with these containers are especially designed for their purpose. They are of the packless type, the usual valve stem packing being replaced with a metallic soldered-on bellows. All leakage past the valve stem is therefore positively eliminated and if the valve outlet is properly plugged as is customary with sampling container valves, a pressure gas or liquid sample can be stored indefinitely without loss of contents or change of composition due to leakage.

REFINING
At A PROFIT In
1932

Increasing Octane Number.
Increasing Gasoline Yield.

Decreasing Operating Costs.
Decreasing Volumetric Losses.

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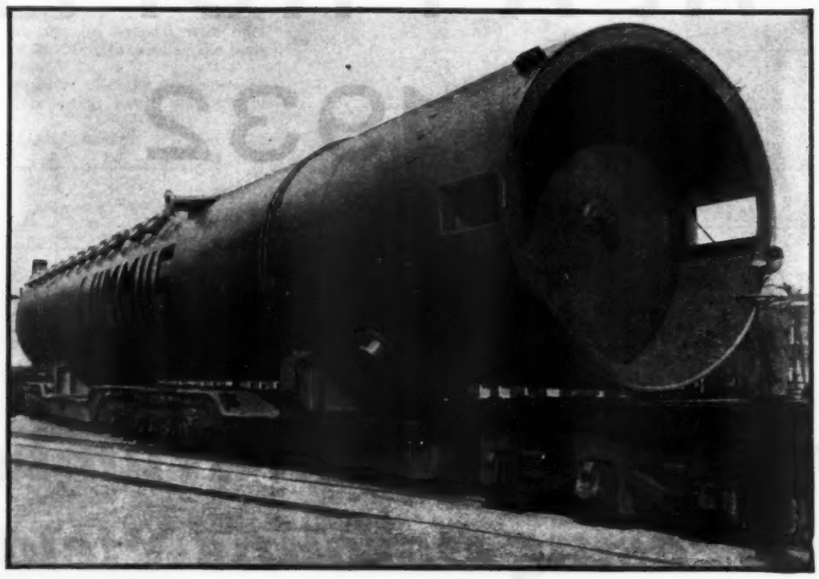
THIS BUBBLE TOWER...



Bubble tower for the complete Lummus installation of a Tube and Tank Cracking Coil now under construction at the plant of Tide Water Oil Company, Bayonne, N. J.

93 FEET LONG
12 FEET DIAMETER

Designed to operate under a pressure of 150 pounds per sq. inch and a temperature of 700° F.

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PETROLEUM REFINING PLANTS

The valves are suitable for pressures up to 150 pounds. Due to the use of a long taper stainless steel needle in a small diameter brass seat, these valves hold tight and may also be used for close regulation when this is required.

[2]Columns L and R respectively in Figure 4 of article, "Apparatus and Methods for Precise Fractional Distillation Analysis," by Walter J. Podbielniak, J. I. E. C., Analyt. Ed. Vol. 3, No. 2, April 15, 1931, p. 181.
[3]"Distillation," J. I. E. C., Vol. 24, No. 1, January, 1932, p. 91.

LABORATORY METHOD FOR EVALUATING CRUDE OILS

(Continued from Page 70)

endpoint. If, however, the cracking stock, as in the Garber crude, moves into lower classes, the cracked gasoline by nominal methods will not have as high rating as the straightrun. The lower the class of the crude, the more benefit is to be obtained in knock rating by lowering the endpoint of the straightrun gasoline.

The proposal takes into account the various factors influencing the final rating of the whole motor fuel from a given crude by assuming that the crudes are all to be run by the same fractionation at 437, and the cracking stock used up completely to the minimum residue, and the entire blend of 437 cuts tested on a test engine.

The following estimate is ventured from experience but without direct experimental data within the definite limits shown. It should be regarded as only roughly indicative.

"A" below 30 octane number
"B" below 35 octane number
"C" below 51 octane number
"D" below 59 octane number
"E" below 64 octane number
"F" below 69 octane number
"G" below 80 octane number

The writer believes the method as outlined is capable of development to standardize crude as to octane rating. Even in its present fragmentary state, and without regard to the suggested grades, it can be relied upon to differentiate between two given crudes by plotting the fractional gravity curves.

USE VACUUM STILL FOR REDISTILLING

(Continued from Page 66)

for steam still distillation and for combination steam still and vacuum are listed in Table 5. A similar comparison for steam distillation and vacuum distillation of debutanized naphtha are given in Table 6. Tables 5 and 6 are based on 400 endpoint gasoline.

Table 4—Operating Conditions When Processing Stocks as Under Table 3

Temperatures—	°F.
Feed to exchanger	102
Feed from exchanger	136
Feed from preheater	157
Reboiler	208
Heater	270
Tower top	210
Partial outlet	98
Absolute pressures—	
Dry line	104 m.m.
Tower top	109 m.m.
Tower bottom	117 m.m.

Table 5*

	Steam stilling	Combination steam stilling and vacuum
Steam, lbs./bbl. overhead ..	310	160

*This presents straight steam stilling versus combination two-stage distillation.

Table 6*

	Steam stilling	Vacuum
Steam, lbs./bbl. overhead ..	310	65

*Comparison of steam requirements when steam stilling versus one-stage vacuum distillation of debutanized naphtha.

The steam quantities given in the tables were obtained from test runs on steam and vacuum stills at the Magnolia Petroleum Co., taking 90 per cent overhead. The quantities of steam will vary with the feed and the percentage taken overhead.

POWER AT LOW COST BY HIGH PRESSURE STEAM

(Continued from Page 83)

refinery. Part of the 125-pound steam is supplied to two 1,250 k.v.a. and one 1,563 k.v.a. General Electric turbo-generators which exhaust at 10 pounds ga. These three generators were formerly located in the old power station and since they fitted into the heat balance to good advantage they were installed in the new station after the high pressure units were put into service. They are operated to supply the exhaust steam required for feed water heating and for stabilizing the pressure in the refinery exhaust steam system. An increase in the generating capacity may be secured by extending the turbine room to permit the installation of two additional high pressure turbines.

Each generator is supplied with an air cooler installed in the concrete foundation for the unit. The temperature of the air entering and leaving the generator windings is recorded by instruments located on the heat balance board. Cooling water is provided by two general service pumps which take suction from the refinery water mains. These pumps also supply cooling water for the bearings on the fans and pulverizers, and the water for quenching the ashes.

In addition to the generators, the turbine room contains the exciters and a motor-generator set for battery charging. The main A.C. switchboard is located at one end of the turbine room in the wall between the turbine and switchrooms. From this board the oil circuit breakers for all generators, refinery feeders and station group feeders are controlled. The circuit breakers for the 2,300 volt motors in the power station are controlled from panels located at or near the motors or from the boiler control boards. On a separate switchboard located in the turbine room has been located all D.C. control equipment, including the circuit breakers for the generator fields, the exciter and motor generator control, and the main and emergency lighting control. On this board are also mounted the voltage regulator and a graphic totalizing wattmeter.

Switching Equipment

The switching equipment for the entire station is located on two floors adjacent to the turbine room. The oil circuit breakers for the generators and feeder groups and the reactors are mounted on the main floor. The circuit breakers for the refinery feeders and for the motors in the station are located in the basement. The reactors are installed in concrete cells provided with ventilated transit doors. All oil circuit breakers are of the Reyrolle armor clad type. This type of switchgear combines the circuit breaker, the disconnect switches, and the bus enclosure in a single structure, which is extremely compact and provides the maximum of safety at all times. The bus and all connections to it are totally enclosed and sealed in compound. The circuit breakers are disconnected from the bus by means of a rack and pinion gear and in case of failure can be replaced by a spare breaker. This involves a minimum interruption of service for the unit. The storage battery is located in a separate room on the upper floor. This battery supplies power for emergency operation of the circuit breakers and for emergency lighting.

The main feeder cables to the refinery leave the building through underground ducts and are carried in this manner to distribution points at various locations in the refinery from which the feeders are carried overhead to the principal points of use.

To eliminate as far as possible the hazards associated with dust accumulations resulting from a pulverized coal plant, the boiler room has been equipped with a vacuum cleaning system. Branches have also been extended into the turbine room for convenience in cleaning this part of the building. To assist in maintaining cleanliness and to improve lighting conditions, all steel work, including fans, ducts, and metal boiler casings have been painted with aluminum paint. Walkways and platforms around the boilers are constructed of Klemp diamond floor grating. Skylights have been installed above the boiler rooms, turbine room, and battery room for lighting and ventilation.

The design of the Stanolind station was carried out by the engineering department of the Standard Oil Co. With the exception of the erection of the structural steel, the elevated storage tank, and the installation of the insulating materials, all construction work for the entire station was carried on by the refinery's construction department.

CENTRAL WEST FIELDS

(Continued from Page 53)

Petersburg, Ind., has secured a considerable acreage in the Bonneville territory, as well as around Walnut Grove Inn, and will start a test at once on the Larkin Key farm, 1½ miles north of Bonneville, the contract work to be done by the well-known driller, Mr. Porter. This well will be closely watched by oil men in general in Hart and adjoining counties. Gardenhire and Bevill are operating a rig several miles southeast of Bonneville in the Owen Hollow area and at last reports had reached 250 feet after having considerable trouble in the hole.

Grayson County Test

Oil men in western Kentucky are looking forward to the completion of the well at Wheeler's Mill, in eastern Grayson County, and directly west of Bonneville, which is wildcat territory, and geologists pronounce the territory as looking very favorable. North of Wheeler's Mill, Bob Byron, of Louisville, Ky., expects to drill a test south of Millerstown and north of Wheeler's Mill, in the extreme eastern part of Grayson County.

Hart County

In Hart County the Mud Branch Oil & Gas Co.'s No. 1 on the Mrs. E. Seymour farm, near Bonneville, is reported with an initial around 75 bbls. and the company is drilling three more in the same area that should be completed within a short period, barring accidents. In the same area, unknown parties' No. 1 on the Mrs. Tom Johnson farm is rated at 50 bbls. initially, while the test on the Willie Johnson farm struck salt water and goes as a duster. In the same county three gas wells are reported on the M. G. Finley, E. E. Gibson and Albert Hodges farms.

Webster County

In Webster County four new gas wells are reported completed: Garretson & Koker's No. 1 Lilburn Allen farm, a mile west of Sebree, reported with 1,500,000 feet at a depth of 650 feet; Iley B. Browning's No. 1 Emil Sellers farm, 2 miles south of Sebree, with 1,250,000 feet; Garrison & Baker's No. 2 J. E. Thornberry farm, rated at 1,250,000 feet, and George Christensen's No. 2 J. A. Curry farm, 3 miles north of Sebree, reported with 1,250,000 feet. The well on the Sellers farm found its gas in the Barlow sand at 1,178 feet. There are now 28 producing gas wells in the Sebree Field of Webster County, with a daily total capacity of 45,000,000 feet. Two gas lines serve the territory, the Missouri Kansas Co., and the Central Gas Corp.

In Daviess County Frank Cox and others' No. 3 well, 135 feet from the north line and 760 feet from the east line of the Charles Bell farm, in the Jones Pool, produced 10 bbls. at a depth of 615 feet.

Barren County

Old Barren County comes to the front with another surprise, the bringing in by Lynne Knapp and others of an oil well on the Ben Shipley farm, 2 miles south of Glasgow Junction, in what was supposed to be worthless territory. The oil was found in the Corniferous formation and when the pay sand was struck at 535 feet the well filled up immediately 300 feet. According to advice the bailer was run 50 times without lowering the fluid to any extent. This wildcat is east of Apple Grove and north of Bon Ayr. According to mapped data a dry hole was drilled northwest some time ago and also in that vicinity three gas wells have been drilled in the past. If the Knapp test holds up like it appears it will be first well of any consequence drilled to the Corniferous in Barren County and may open an important new producing area. While the new producer is generally west of the old Barren County production there is no relation because the old wells were found in different sands. The Shipley farm well is approximately 8 miles northwest of Glasgow. The same operators drilled a test about a half mile northwest before making the location on the Shipley farm and while it was dry and abandoned the formations were sufficiently encouraging, together with the presence of a gas well in the vicinity of Apple Grove, to warrant the reward which has been revealed. The test was carried to the Blue Sand.

A local syndicate has leased a block of 10,000 acres, around Danville, the county seat of Boyle County, in the central part of Kentucky, and will attempt to find gas for domestic use. This area is directly south of Franklin, the state capital, being the third county south of Franklin.

Legrande Purchase

A deal involving 1,266 acres of oil and gas property in the Legrande Field of Hart County on which are 35 oil wells and 3 gas wells with an estimated production of 1,750 bbls. of oil daily and 2,000,000 feet of gas has been consummated, it was announced by H. Z. Clark, one of the purchasers. The property was sold by L. C. Young, of Lexington, who was one of the first developers of the Legrande Pool discovered in September, 1930. The amount is understood to have been around $350,000.

The purchasers are H. Z. Clark, of Horse Cave; Thomas Wittmer, of Pittsburg; W. K. Snyder, of Horse Cave, and Mrs. Anna K. Wilson of Bowling Green, Ky. Oil that has heretofore been shipped from the lease of the Young properties to a Louisville refinery will be diverted to the Simrall Refining Corp. of Horse Cave which is owned in part by Wittmer. The Simrall Corp. is now building a refinery at Windsor, Canada, and will ship by tank cars enough crude petroleum from the oil fields here to supply the plant there. The two plants will refine approximately 5,000 bbls. daily. Crude shipped into Canada is duty free while the gasoline tariff to that country is 5 cents per gallon.

The firm of Clark, Snyder & Wittmer has been active in the drilling of oil and gas wells in Hart and Barren Counties for the past year and the new acquisition to its holdings will give it control of leases that may be developed by further drilling to 5,000 bbls. a day or more. The Horse Cave plant is now using 2,100 bbls. of crude daily.

This sale, with manufacturing arrangements to open markets for refined products, will relieve the prorating of output from this district and augurs for improvement in prices and the subsequent renewal of drilling activities. The purchasers of the L. C. Young properties, it is understood, take over all the leases and well equipment of the holdings in the Legrande area which embraces the Legrande-McGee lease, Perkins, Shaw and others. Included in the boundary are some properties in defined locations that have not been drilled.

MAY LEASE UNIVERSITY LAND

AUSTIN, Tex., Mar. 28.—Rising prices and stronger demand for oil leases soon will lead the University of Texas to open more of its West Texas oil lands to development, university officials said during the March meeting of the board of regents. Geologizing and survey of the university lands recently was transferred by the legislature back from the leasing board to the board of regents. Field representatives of the regents, accompanied by Regent Robert L. Holliday, members of the leasing board, made an extended survey of undeveloped oil lands of the university at the close of the board meeting.

WILDCAT OPERATIONS IN LOUISIANA-ARKANSAS

(Continued from Page 42)

MOREHOUSE PARISH

United Gas Public Service Co.'s No. 2 Sandidge, Sec. 11-20n-4e, 656 ft. S, 1,332 ft. W. NE cor. NW .....S.D. 2,132 ft.

NATCHITOCHES PARISH

W. M. Coates' No. 1 Ross Olive, Sec. 10-9-10, 660 ft. S and E from cen. of Sec. .....Location.
Dr. H. S. Gerson's No. 1 Smith, Sec. 11-10-8, 2,000 ft. N, NE cor. of irregular Sec. 10, in Sec. 11 .....Arranging to deepen 585 ft.
R. A. Keaton's No. 1 Stephens, Sec. 35-10-6, 320 ft. N and W, SE cor. NW NW .....S.D. 178 ft.

OUACHITA PARISH

Wilson & Mitchell's No. 1 Williams, Sec. 5-16-1,e 330 ft. E, 240 ft. S, NW cor. SW SE .....Set 6-in. 2,655 ft; corrected depth 2,666 ft.

RED RIVER PARISH

La. Oil Dev. Co.'s No. 2 La. Delta Pecan Co., 2,950 ft. S, 300 ft. E, NW cor., Sec. 27-13-11 .....Spudded and S.D. 50 ft.

RICHLAND PARISH

National Gas Co.'s No. 1 Singletary, 1,980 ft. N, 660 ft. W, SE cor., Sec. 30-18n-7e .....S.D. 2,515 ft.

SABINE PARISH

Baird & Hunter's No. 1 Petty, Sec. 11-7-11 .....Set 6-in. 2,370 ft.
Beene et al's No. 1 Ezernack, Sec. 2-7-13, 1,070 ft. S, 350 ft. W, NE cor. .....Coring 2,044 ft.
Baird & Stone's No. 1 Quayhaglen, Sec. 11-7-11 .....Testing 2,508 ft.
Broderick & Calvert's No. 1 Costello, Sec. 2-7-14, 375 ft. S, 150 ft. W, NE cor. SE NW .....Derrick.
Coates Pet. Co.'s No. 1-B S. S. Martinez, Sec. 3-7-13, 330 ft. S and W, NE cor. SE NE .....Derrick.
W. M. Coates' No. 1 Stille, 330 ft. N, 660 ft. W, SE cor., Sec. 35-8-13 .....Derrick.
W. M. Coates et al's No. 1 Mansfield Hardwood Lbr. Co., Sec. 36-8-13, SW cor. SE SE .....Completed for 135 bbls. 2,403 ft.
B. A. Ferrell's No. 1 Haley, Sec. 6-7-13, 300 ft. S and E, NW cor. NW SW .....Set 10-in. 103 ft.
Frank Foster, Inc.'s No. 1 Stephens, Sec. 20-9-11, 330 ft. S and W, NE cor. NW NW .....Arranging to set 6-in. 3,340 ft; T. D. 3,358 ft.
R. L. Gay, tr.'s No. 1-A Long Bell Lbr. Co., 430 ft. S, 200 ft. W, NE cor. NW NW, Sec. 10-8-13 .....Set 6⅝-in. 4,725 ft; T.D. 4,772 ft.
E. G. Hall's No. 1 Williams, SE NW Sec. 3-7-10 .....Rigging up.
Root Ref. Co.'s No. 1 Peterson, 330 ft. N and E of C. Sec. 34-7-13 .....Set 6⅝-in. 2,495 ft.
Geo. LeGrand's No. 1 McGough, Sec. 3-8-10 .....Derrick.
J. J. Keen, tr.'s No. 1 Belton (no check), Sec. 31-9-13....Coring 3,120 ft.
A. D. King, tr.'s No. 1 Germain, Sec. 7-7-10, 330 ft. E, 518 ft. N, SW cor. NE NE .....Rigging up.
W. F. Lacey's No. 3 McNeely, Sec. 14-7-11, 300 ft. S and E, NW cor. NE NE .....Derrick.
Jack Lanier's No. 1 Petty, Sec. 11-7-11, 330 ft. N and W SE cor. NE SE .....Location.
E. F. Neely's No. 1 Cobb & Alford, Sec. 14-7-11, 200 ft. S, 100 ft. E, NW cor. NE SW .....W.O.S.R. 2,565 ft.
E. F. Neely's No. 2 Clanan, Sec. 14-7-11, 500 ft. N, 100 ft. W, SE cor. SE NW .....Set 6-in. 2,434 ft.
C. E. Neff, tr.'s No. 1 Snell, Sec. 9-7-11, 350 ft. N, 660 ft. W, SE cor. Sec. .....Derrick.
Palmer & Smitherman's No. 1 La. Long Leaf Lbr. Co., Sec. 12-7-11, 330 ft. S and E, NW cor. NE SE .....Location.
Palmer & Smitherman's No. 2 La. Long Leaf Lbr. Co., 330 ft. S and W, NE cor. NE SE, Sec. 12-7-11 .....Location.
Palmer & Smitherman's No. 3 La. Long Leaf Lbr. Co., 330 ft. S and W, NE cor. NE SW, Sec. 12-7-11 .... Location.
H. W. Perritt's No. 1 Brown Lbr. Co., Sec. 6-7-10, 330 ft. N and E, SW cor. SW SE .....Set 6-in. 2,379 ft.
Rowe et al's No. 1 Williams, Sec. 13-7-11, 600 ft. S, 40 ft. E, NW cor. SW .....Set 6-in. 2,439 ft.
Scully & Beach's No. 1 Lafitte, Sec. 13-7-11, 100 ft. S, 660 ft. E, NW cor. NW .....Derrick.
H. R. Smith et al's No. 1 La. Long Leaf Lbr. Co., Sec. 12-7-11, 330 ft. S and W, NE cor. NW SW .....Location (corrected).
H. R. Smith et al's No. 2 La. Long Leaf Lbr. Co., 330 ft. N and W, SE cor. NW SW, Sec. 12-7-11 .....Set 6-in. 2,460 ft.
J. E. Smitherman's No. 1 Smith, Sec. 7-7-10, 330 ft. S and E, NW cor. NW SW .....S.D.; W.O. 3,014 ft.
Southland Drlg. Co.'s No. 2 F. Martinez, Sec. 11-7-13, 330 ft. S and E, NW cor. NE NW .....Derrick pattern.
Southland Drlg. Co.'s No. 1 Gilbert Martinez, Sec. 2-7-13, 330 ft. N and W, Sec. cor. SW SW .....Derrick pattern.
A. F. Tarver's No. 3 Cutrer, Sec. 12-7-11, 1,120 ft. E, 300 ft. N, SW cor. NW .....Set 10-in. 100 ft; drlg. 210 ft.
A. H. Thames' No. 1 Edward est., 150 ft. NW SE cor. NE SE, Sec. 8-8-13 .....Rig moved and abd. 1,400 ft.
C. H. Tuttle's No. 1 Travis, Sec. 13-7-11, NE NW .....Set 10-in. 100 ft; drlg. 1,740 ft.

TENSAS PARISH

A. R. Willis et al's No. 1 Currey, 1,320 ft. S, 1,320 ft. E, NW cor., Sec. 39-11-12 .....S.D. 3,545 ft.

WEBSTER PARISH

J. K. Wadley's No. 1 Matthews, Sec. 11-23-9, 130 ft. N, 330 ft. E, SW cor. SW NE .....Drlg. 75 ft.

ARKANSAS

COLUMBIA COUNTY

Kendall Oil Co.'s No. 1 Fullenweider, Rhea & Kitchen, Sec. 13-17-22 .....S.D. 814 ft.

CLAY COUNTY

S. C. Jeffus' No. 1 Underwood, 510 ft. N, 350 ft. W, C, NW SE, Sec. 4-20-3 .....S.D. 1,350 ft.

CLEVELAND COUNTY

Crum & Stillwell's No. 1 E. R. Bell, Sec. 10-10s-12 .....Rigged up and S.D.

CLEBURNE COUNTY
(Cable tools)

Donnelly-Craver et al's No. 1 Donophan Lbr. Co., SE cor. NW, Sec. 33-11-9 .....S.D. 3,740 ft.

DALLAS COUNTY

J. H. James, tr.'s No. 1 Fordyce Lbr. Co., 200 ft. S, 200 ft. E, NW cor. SE, Sec. 11-9-15 .....Drlg. chalk 2,575 ft.
Zepp O. & G. Co.'s No. 3 Hillman, Sec. 20-10-13, 180 ft. N, 450 ft. E, SW cor. NW NE .....Location.

DREW COUNTY

Co-Operative Dev. Co.'s No. 1 Ogles, Sec. 35-15-5, 330 ft. S and E, NW cor. NE NW .....S.D. 1,890 ft.

HOT SPRINGS COUNTY

Star Oil Co.'s No. 1 Cunningham, 285 ft. S, 285 ft. W, NE cor., Sec. 11-5-16 .....Washing to bottom 1,300 ft.

LINCOLN COUNTY

Lawrence Cook, tr.'s No. 1 McGhee Planting Co., 420 ft. S, 200 ft. W, NE cor. NE SW, Sec. 5-8-7 .....S.D. 2,300 ft.

LITTLE RIVER COUNTY

Roberts Oil Co.'s No. 1 H. J. Russell, 330 ft. E, 330 ft. S, NW cor., Sec. 25-13-19 .....Location.

LOGAN COUNTY

J. H. Flowers' No. 1 J. H. White, Sec. 13-6-26 .....S.D; W.O. 3,570 ft.

MILLER COUNTY

W. R. Noel et al's No. 1 Dickson hrs., 1,980 ft. W, 660 ft. S, NE cor., Sec. 11-20-27 .....S.D. 1,955 ft.

OUACHITA COUNTY

Copenhaven et al's No. 2 Berg, C SE SE, Sec. 13-15-17..Fishing for D.S. 2,011 ft.
McLean et al's No. 1 L. D. Neely, Sec. 23-15-14, 200 ft. N and W, SE cor. NE SW .....S.D. 102 ft.

PIKE COUNTY

E. R. Henderson's No. 1 Tilyou, 660 ft. W, 500 ft. S, NE cor. NE SE, Sec. 24-8-14 .....T.A. 2,909 ft.
E. R. Henderson's No. 1 J. L. Lee, 400 ft. S, 350 ft. E, NW cor. SW SE, Sec. 31-8-24 .....S.D; W.O. 1,020 ft.
E. R. Henderson's No. 1 W. B. East, 200 ft. S, 150 ft. W, NE cor., Sec. 13-9-23 .....Coring 2,037 ft.

PRAIRIE COUNTY

Powell Creek O. & G. Co.'s No. 1 Kloss, NE SW, Sec. 3-4n-6w .....Partly rigged up and S.D.

SCOTT COUNTY

Heavener O. & G. Co.'s No. 1 Riser, Sec. 36-4-26 .....S.D; T.D. 1,436 ft.
Waldron O. & G. Co.'s No. 1 White, NE cor. SW NW, Sec. 17-3n-29 .....S.D. 1,860 ft.

SEVIER COUNTY

Tristate Oil Co.'s No. 1 Grimble, Sec. 34-5-22, S½ SW ..S.D. 950 ft.

ST. FRANCIS COUNTY

Field & Jones No. 1 F. M. White, Sec. 1-4n-2e, SW cor. NW .....S.D. 700 ft.

UNION COUNTY

Drillers Oil & Dev. Co.'s No. 1 Pickering, 220 ft. N, 668 ft. E, SW cor. NW NE, Sec. 1-17-16 .....T.A. 2,134 ft.
Drillers Oil & Dev. Co.'s No. 1 Haynie, Sec. 1-17-16, 200 ft. S, 300 ft. E, NW cor. NW SE .....Coring 2,132 ft.
H. H. Helms' No. 1 C. H. Murphy, NE cor. NW NE, Sec. 21-16-14 .....Coring salt water sand 2,762 ft.
L. M. Hill et al's No. 1 J. W. Barnes, Sec. 21-19-16, NE cor. Sec. .....Derrick.
Sunby et al's No. 2 Perdue, Sec. 33-16-14, 75 ft. S, 150 ft. E, NW cor. Sec. .....W.O., 6-in. set. at 1,690 ft.
Wilson & Chapman's No. 1 King, Sec. 3-18-13, 330 ft. N and E, SW cor. NE NE .....Derrick.
Wilson & Chapman's No. 1-A D. Norman, 330 ft. S and E, NW cor. N½ NE SE, Sec. 3-18-13 .....Derrick.
Wilson & Chapman's No. 1 K. D. Parker, Sec. 3-18-13, 330 ft. N and E, SW cor. S½ NE SE .....Coring sand 3,567 ft.

WASHINGTON COUNTY
(Cable tools)

C. H. Willoughby's No. 1 Jones, Sec. 34-16-30.....S.D. for funds 1,795 ft.

YELL COUNTY
(Cable tools)

Tegmeier & Luckett's No. 1 Falcon, Sec. 26-7-21.....S.D. 5,710 ft.

EAST TEXAS

BOWIE COUNTY

Logan & Elliott's No. 1 Smith, 9,600 ft. S, 2,500 ft. W, NE cor. Chas. Lewis Sur. .....S.D. 4,505 ft.
Tarkington & Jones' No. 1 W. W. Whybark, 200 ft. S, 200 ft. W, SW cor. J. H. Dyer Sur. .....S.D. 1,880 ft.
Lee Timberlake et al's No. 2 Tidwell, 2,510 ft. N, 655 ft. W, SE cor. T. M. Rice Sur. .....S.D. 3,000 ft.

CASS COUNTY

J. F. Morrisey's No. 1 T. J. Wilson, 1,988 ft. S of N line, 2,376 ft. E of W line of H.R.S., J. R. McFarland Sur. .....S.D. 3,670 ft.
Davis & Pigg's No. 1 Roy Bryan, SW cor. Roy Bryan 88-ac. tr., Albert H. Lattimer Sur. .....S.D. 2,860 ft.
Wm. S. King's No. 1 T. R. Richey, 1,450 ft. N, 1,600 ft. W, SE cor. Lavinia Morenew Sur. .....Set 10-in. at 112 ft.; drlg. 1,706 ft.
C. E. Murdock's No. 1 First National Bank, Evans Watson Sur. .....S.D. 4,390 ft.
John C. Rogers' No. 1 I. E. Lanier, 573 ft. N, 579 ft. W, SE cor. Lanier 86 ac. in K. E. Welborn Sur. ....S.D. 2,280 ft.
Olds & King's No. 2 Anthony, John C. Byers Sur. ....S.D. 1,760 ft.
John C. Rogers et al's No. 1 W. Q. Henderson, 3,100 ft. S, 3,100 ft. E, NW cor., Wm. Davis Sur. .....S.D. 960 ft.

HARRISON COUNTY

T. W. Davidson's No. 1 Gochee et al, NW cor. R. W. Starr Sur. .....Location.
Lloyd Oil Corp.'s No. 1 E. S. Timmons, 150 ft. from N line to 250 ft. from E line of 105-ac. tr., Findley Sur. .....S.D. 4,195 ft.
Ryan Cons. Pet. Corp.'s No. 1 J. M. Fuhr, 1,300 ft. N of NW cor. T. J. Copelin Sur., 1,675 ft. SW at right angles to NW SE line of O'Neal Sur. .....Derrick.

MARION COUNTY

Baunoch Dev. Co.'s No. 1 Miller, 725 ft. N, 1,470 ft. E, SW cor. H. Fulgram Sur. (was Gist, Claunch & Dodson) .....T.D. 3,280 ft.
Geo. Hindeman et al's No. 1 F. V. Lindsey, 2,500 ft. S, most northerly N line, 3,555 ft. E most easterly W line, Alexander Albright Sur. .....S.D. 2,330 ft.

PANOLA COUNTY

Hoffer et al's No. 1 Cameron Lbr. Co., center 1,306-ac. tr. in W. M. A. LaGrove Sur. .....Derrick.
Moses & Wallace's No. 1 Daniel, 600 ft. N and W lines, Mrs. Gerrell 100-ac. tr., SW cor. Isabel Hanks Sur...Spudded and S.D.
G. A. Davidson's No. 1 Latham, Wm. Rich. Sur. .....S.D. 2,394 ft.
J. L. Nelson et al's No. 1 J. W. Williams, 300 ft. S, 700 ft. W, NE cor. Williams' 67-ac. tr. in James Hanks Sur. .....S.D. 3,055 ft.
United Prod. Co.'s No. 1 L.W.S.H. Co., 1,350 ft. N, 542 ft. E, SW cor. 95-ac. tr., B. C. Jordan Sur. .....Set 15½-in. at 150 ft., 10½-in. at 1,200 ft.

RED RIVER COUNTY

D. M. Buffington's No. 1 Hossler, E. Hughhart Sur. ....S.D. 2,795 ft.
Johnson Pet. Co.'s No. 3 Randolph, Edw. Dean Sur. ....S.D. 2,280 ft.

SHELBY COUNTY

Chapperell Oil Co.'s No. 2 Holt, Matthew Moore Sur. ...Coring 3,225 ft.
Harry Elliott's No. 1 Pickering Lbr. Co., 1,000 ft. N, 150 ft. E, SW cor. 361-ac. tr., G. H. Patterson Sur...W.O., S.R. 1,543 ft.
Fuller & O'Brien Bros.' No. 1 Frost-Johnson Lbr. Co., 200 ft. S, 150 ft. W, NE cor. 168-ac. tr., Aaron Castleberry Sur. .....Rigging up.
K. H. Francis' No. 1 John Mims, Mary Smith Sur. .....S.D. 3,382 ft.
H. H. Gracey's No. 1 J. A. Morrison, 1,500 ft. N, 200 ft. E, SW cor. J. A. Morris' 109-ac. tr., William English Sur. .....S.D. 2,600 ft.
Henry Maulding's No. 1 Frost Lbr. Co., NE cor. Frost Lbr. Co.'s 80-ac. tr., A. D. Fountain Sur. .....S.D. 3,246 ft.
McRoby et al's No. 1 Windham, Wm. Leach Sur., on Windham 296-ac. tr. .....S.D. 3,393 ft.
W. Ray & Dunbar's No. 1 C. A. Hayden, 600 ft. N and W SE cor. 152-ac. tr. in D. T. F. Yordt Sur. .....Rigging up.
Ridgeway et al's No. 1 Polley, Dominguez Gonzales Sur., 2,180 ft. E of SW cor., 160 ft. N at right angles of Polley 457-ac. tr. .....S.D. 822 ft.
Sedberry et al's No. 1 Pickering Lbr. Co., 600 ft. N, 400 ft. E, SW cor., Jane Stoddard Sur. .....Location.
C. H. Tautenhahn's No. 1 J. C. Bogard, 300 ft. S, 900 ft. E, NW cor. J. C. Bogard's 52-ac. tr., Thomas Baker Sur. .....S.D. 20 ft.
Western World's No. 1 Foster, Billingsby-Jeremiah Bowlin Sur. (was Stephens et al's No. 1 Foster) .....S.D. 2,460 ft.

LOUISIANA-ARKANSAS PROVEN AREAS

(Continued from Page 42)

ARKANSAS

UNION COUNTY—EL DORADO

Lion O. & R. Co.'s No. 9-A G. P. Hayes, 242 ft. S, 246 ft. W, NE cor. Lot 5, NE, Sec. 4-16-15 .....S.D; high wtr. 7,255 ft.
Southern Prod. Co.'s No. 1 Wingfield, NE cor. SE NW, Sec. 16-19-15 .....Drlg. 2,630 ft.

UNION COUNTY—URBANA

Marine Oil Co.'s No. 1 Winn est., 330 ft. S and E, NE cor. S½ NW, Sec. 11-18-13 .....T.A. 3,586 ft.
Marine Oil Co.'s No. 3-E Thompson, 330 ft. N, 330 ft. E, SW cor. NE NE, Sec. 10-18-13 .....Location.
Wilson & Chapman's No. 1-B Hadley, Sec. 3-18-13, 330 ft. S and W, NE cor. SE NW .....T.A. 3,545 ft.

Valves by Jarecki
The builders of this battery cling to an old-fashioned idea. They believe that the price of tanks is not merely a matter of first cost but one that involves repairs, replacements and length of service.
To reduce repairs and replacements, and to increase the life of the line, they chose JARECKI Valves.
Thus they take advantage of the standards JARECKI has maintained, in good times and poor, for over 80 years. These standards include triple testing of every valve that leaves the JARECKI plant; and they call for pressures far BEYOND the ratings of the valve under test. That means not only longer life but the reserve strength to cope with emergencies as they arise.
The JARECKI store in your vicinity is at your command.
Jarecki
MANUFACTURING COMPANY
Home Office and Factory—ERIE, PA., U. S. A.
General Office—ST. LOUIS, MO.
District Offices—Pittsburgh, Pa.; El Dorado, Kans.; Tulsa, Okla.; Newark, Ohio; Eastland and Dallas, Texas; Lawrenceville, Ill.
Branch stores at all important places in the Oil Country.

Std. Single or Multi-Speed

Self-Cleaning

Drip-Proof

Pipe-Ventilated

Totally Enclosed Fan-Cooled

Explosion-Proof

Arbor Type

YOU NAME THE JOB WE'LL BUILD THE MOTOR

THE RIGHT MOTOR FOR EVERY JOB

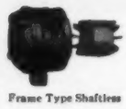
Vertical

Flange-Mounted

Holst Type

Wound-Rotor

Direct Current


Frame Type Shaftless

Rolled Shell Shaftless

THIRTY YEARS DELIVERING "MORE THAN HORSE POWER"

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STANDARD AND CUSTOM BUILT MOTORS

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THE LOUIS ALLIS COMPANY
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Please send me descriptive information and your recommendation on the *right* motor to drive:.....

Mr.....Company.....

Address.....

EAST TEXAS

PANOLA COUNTY

Daisy O. & G. Co.'s No. 1 Rucks, John Palmer Sur. ....T.A. 2,194 ft.
Nat. Gas Prod. Co.'s No. 1 Cadenhead, 5,219 ft. N, 5,620 ft. E, SW cor. B. C. Jordan Sur. .....Set 12½-in. 40 ft.
United Prod. Corp.'s No. 17 Steele, 1,320 ft. N, 660 ft. W, SE cor. C. D. Steele lse., in B. C. Jordan Sur. ..Location.

MISSISSIPPI

HINDS COUNTY

James Alexander, tr.'s No. 1 Pullen, Sec. 26-6n-1e, C NW NE .....Derrick.
Belhaven College's No. 1 fee, Sec. 35-6n-1e, 360 ft. E. 210 ft. S, NW cor. SE NW .....Drlg. 1,334 ft.
Ferguson-Fuller et al's No. 1 Cruse, Sec. 34-6n-1e, 420 ft. E, 170 ft. N, SW cor. NW .....Completed for 44,000,000 ft. gas at 2,465 ft.
Love Pet. Co.'s No. 1 Interior Lbr. Co., Sec. 2-5n-1e, 90 ft. W, 270 ft. N, SE cor. SW .....Leaky 6⅝-in. 2,435 ft; arranging to set 5 3/16-in. inside.
McGuire et al's No. 1 Spring Lake, Sec. 11-5n-1e, 250 ft. N, 450 ft. W, from center of Sec. .....Rigging up.

RANKIN COUNTY

Cummins & Montgomery's No. 1 Ivey, Sec. 13-5n-1e, NE Lot 10, Blk. D, E. Jackson Pl., First Addn. ..Location abd.
Meredith et al's No. 1 Strowder, Sec. 12-5n-1e, SE cor. SW NE .....Completed for 38,000,000 ft. gas at 2,384 ft.
Muse & Muse's No. 1 Pate, Sec. 12-5n-1e, 220 ft. N, 1,150 ft. W SE cor. .....Derrick.

WILDCAT OPERATIONS IN MISSISSIPPI

HINDS COUNTY

Company, farm and location—	Remarks:
Atkins et al's No. 1 Crane Lawrence, Sec. 23-6n-1e, 300 ft. E, 132 ft. N, SW cor. NE SE	Derrick.
Miss.-Minn. Oil Co.'s No. 1 Edwards Land Co., Sec. 23-6n-4w, 1,200 ft. N and E from center of Sec.	Drlg. gummy shale 1,485 ft.
Southern Pet. Co.'s No. 1 Wilton (was Tri-State O. & G. Co.'s), 320 ft. E, 240 ft. N, SW cor. SE NE, Sec. 28-6-1e	Set 4½-in. 2,498 ft.

JASPER COUNTY

Bay Springs Pet. Co.'s No. 1 Keyes, C NW NE, Sec. 2-12-9 .....T.A. 3,408 ft.

LOWNDES COUNTY

Lowndes County Oil & Dev. Co.'s No. 1 Carr est., Sec. 34-17-16e, 1,320 ft. E, 330 ft. S, NW cor. Sec. .....Rigging up.

NEWTON COUNTY

Bob Dalton's No. 1 Majure, 400 ft. N, 300 ft. E, SW cor. SE, Sec. 25-6n-11e .....S.D. 840 ft.

NOXUBEE COUNTY

Thompson & Donohue's No. 1 Donohue, Sec. 25-16n-17e..S.D. 1,735 ft.

RANKIN COUNTY

Attkisson & Dyer's No. 1 Valentour, 200 ft. S, 200 ft. E, NW cor., Sec. 18-5n-2e .....Set 6-in. 2,428 ft.
James Alexander, tr.'s No. 1 Ridgeway-McGehee, Sec. 1-5n-1e, 200 ft. N, 320 ft. W, SE cor. NE SE .....S.D. with 6 joints D.S. in hole at 2,327 ft.
Baker et al's No. 1 Rankinside Dev. Co., Sec. 6-5n-2e, 200 ft. N, 200 ft. E, SW cor. NW SW .....Set 6⅝-in. 2,360 ft.
Majestic O. & G. Co.'s No. 1 Elton Lbr. Co., Sec. 10-4n-3e. Derrick.

SCOTT COUNTY

M. U. Culley et al's No. 1 Owens, Sec. 2-8-9 .....Derrick.

SHARKEY COUNTY

United Gas Public Service Co.'s No. 1 Lenhart, Sec. 14-14n-6w, 660 ft. N of C of S line of Sec. .....S.D. high water 1,162 ft.

WARREN COUNTY

Eagle Bend O. & G. Co.'s No. 1 Kiger, SW cor. SW SE, Sec. 9-18-2 .....S.D. 2,607 ft.

GULF COAST FIELDS AND WILDCATS

(Continued from Page 43)

Sinclair Oil & Gas Co.'s No. 12 Wilburn, Wm. Hodges Sur., 150 ft. W of No. 10 and 50 ft. N of S line ...Derrick.
Sun Oil Co.'s No. 14 J. Wilburn, Henry Hodges Sur., 150 ft. W of No. 12 and 50 ft. from N line .....Drlg. rock 833 ft.
The Texas Company's No. 6 Wilburn (D.D.), Henry Griffith League .....Set 114 ft. of 5-in. screen 5,000 ft.; swabbed salt water.
Texas Gulf Producing Co.'s No. 1 Scott Fitzgerald, 125 ft. from S line and 71 ft. from E line of Strip No. 1, Henry, Griffith League .....Shale 5,171 ft.; reaming.
Texas Gulf Producing Co.'s No. 9-B Kirby, Henry Griffith League, 50 ft. out of SW cor. of J. M. Fitzgerald 50-acre tract and 110 ft. S of N line of Kirby tract .....Reaming 2,166 ft.
Texas Gulf Producing Co.'s No. 6-H Kirby (W.O.), H. Griffith League .....Drlg. sand and shale 5,255 ft.
Texas Gulf Producing Co.'s No. 7-A Barber, Henry Griffith League, 712 ft. from W line and 225 ft. from N line of tract .....Drlg. rock 2,287 ft.

BLUE RIDGE—FORT BEND COUNTY

Gulf Prod. Co.'s No. 19 Luscher, Thos. Habermacher Sur., 1,650 ft. from N line and 550 ft. from E line of 490-acre tract .....Drlg. sand and shale 3,656 ft.

ORCHARD—FORT BEND COUNTY

Gulf Prod. Co.'s No. 32 Moore, Jas. Frazier Sur., N of No. 20 .....Drlg. gumbo 2,522 ft.

RABBS RIDGE—FORT BEND COUNTY

Gulf Prod. Co.'s No. 1 T. R. Booth, Samuel Kennedy Sur., 475 ft. N of S line of Booth 475-acre tract, due N offset No. 1 Booth-Meyers .....Drlg. sandy shale showing oil 5,062 ft.
Humble Oil & Ref. Co. and Gulf Prod. Co.'s No. 3 George, John Rabb Sur., 1,000 ft. due E of No. 2 ....Cored sand showing oil 5,130-42 ft.; cmtd. 6⅝-in. csg. 5,095 ft.
Humble Oil & Ref. Co. and Gulf Prod. Co.'s No. 3 Lockwood, John Rabb Sur., 1,000 ft. due E of No. 2 .....Rig.
Humble Oil & Ref. Co. and Gulf Prod. Co.'s No. 2-B Lockwood & Sharp, John Rabb Sur., 600 ft. W of No. 1-B .....Derrick.

HIGH ISLAND—GALVESTON COUNTY

Yount Lee Oil Co.'s No. 26 Cade, N. Fitzsimmons Sur., 600 ft. S of No. 24 .....Drlg. sand and lime 4,150 ft.
Yount Lee Oil Co.'s No. 27 Cade, N. Fitzsimmons Sur., 600 ft. N of No. 21 in line with Nos. 22 and 23 .....Drlg. gumbo 1,325 ft.
Yount Lee Oil Co.'s No. 1 Broussard & Orme, 300 ft. E of N cor. of N. Fitzsimmons Sur., in Martin Dunman Sur. .....Drlg. sand and lime 4,820 ft.

SARATOGA—HARDIN COUNTY

Rio Bravo Oil Co.'s No. 131-A "B" .....Sand 490-513 ft.; comp. pumping 10 bbls. daily.
Rio Bravo Oil Co.'s No. 132-A "B" .....Sand showing oil 517 ft.

HUMBLE—HARRIS COUNTY

J. E. Burt et al's No. 2 C.O.&G.-The Texas Co. fee, J. B. Stevenson Sur., 450 ft. N of No. 1 .....Location.
Rio Bravo Oil Co.'s No. 7 fee (W.O.), W. B. Adams Sur., 216 ft. from W line and 50 ft. from S line of 22-acre tract, Bender South Addition .....Rig up to work over.

Sun Oil Co.'s No. 27 Bender, W. B. Adams Sur., 250 ft. W of No. 26 in line with No. 25 ..... Heaving shale 4,440 ft.; reaming.

Sun Oil Co.'s No. 50 River, Robert Dunman Sur., 102½ ft. from W line of W.&P., Blk. 25, due W offset E. M. Wilson's No. 8 W.&P. ..... Sand and shale 1,396 ft.; comp. flowing 15 bbls. daily.

PIERCE JUNCTION—HARRIS COUNTY

Anderson & Plummer's No. 4 Whitehead (W.O.) ..... T.D. 4,521 ft.; sidetracked to 4,470 ft.; drill pipe stuck.

Humble Oil & Ref. Co.'s No. 1 Hooks (D.D.), James Hamilton Sur. No. 52, 904 ft. N of SW cor. along W line of lease and 396 ft. E at right angles ..... Cap rock 4,255 ft.; plugged to 3,896 ft.; set 25 ft. of 4½-in. screen 3,805 ft.; comp. flowing 99 bbls. in first 20 hrs.

Pure Oil Co.-Moody Receiver's No. 3 Herman, Jas. Kopman Sur., 200 ft. due W of C of E line of 25-acre tract ..... Gumbo 1,457 ft.; trying to set 10¾-in.

Rio Bravo Oil Co.'s No. 24-A Settegast, J. Kopman Sur. No. 44, 1,900 ft. S and 200 ft. W of NE cor. of "A" lease ..... Rigging up.

Rio Bravo Oil Co.'s No. 8-B Settegast (D.D.), J. Kopman Sur. No. 44, 300 ft. from N line and 50 ft. from E line of "B" lease ..... Rig up to deepen 3,327 ft.

MYKAWA—HARRIS COUNTY

F. R. Flannigan et al's No. 3 Minnetex (W.O.), 125 ft. from W line and 100 ft. from S line of Blk. 252, Wm. Lovett Sur. ..... Cleaning hole to work over 4,873 ft.

ESPERSON—LIBERTY COUNTY

Cranfill-Reynolds Co.'s No. 20 Esperson, C. W. Fisher Sur., 471 ft. from W line and 510 ft. N of No. 5 Esperson ..... Drlg. shale and lime 1,796 ft.

Cranfill-Reynolds Co.'s No. 9 Moore's Bluff, M. Duncan Sur., 500 ft. S of N line of Moore's Bluff tract in line with No. 6 Davis and No. 6 Moore's Bluff ..... Location.

HANKAMER—LIBERTY COUNTY

Gulf Prod. Co.'s No. 15 Boyt, H.&T.C. Sur. No. 22, 500 ft. E and 500 ft. S of No. 12 ..... Drlg. gumbo 796 ft.

HULL—LIBERTY COUNTY

Eclipse Oil Co.'s No. 1 Barrow, Jesse Devore Sur., 50 ft. from N line and 31 ft. from E and W lines 37-acre tract ..... Drlg. shale showing oil and gas 4,450 ft.

Republic Prod. Co.'s No. 145 Dolbear, Jesse DeVore Sur., 200 ft. SE of No. 85 and 200 ft. N of No. 61 ..... Set 2 jts. screen 2,483 ft.; comp. flowing 800 bbls. P.L. oil, ¾-in. choke.

MARKHAM—MATAGORDA COUNTY

Claude Hamill et al's No. 1 Northern Irrigation Co., 50 ft. out of SW cor. of N 80 acres (half) of NW Sec. 5, Blk. 9, I.&G.N. Sur. ..... Drlg. gumbo 1,852 ft.

L. P. Smith et al's No. 2 Hudson, 850 ft. from E line and 1,050 ft. from S line Blk. 15, Henry Parker Sur. ..... Sand showing oil 3,238-50 ft.; setting casing.

United North & South Oil Co.'s No. 1 McDonald, I.&G.N. Sur., Blk. 9, Sec. 5, 460 ft. S and 80 ft. E of NW cor. 35-acre tract ..... Set 1 jt. screen 3,678-98 ft.; tested salt water; cmtd. to test sand 3,577-81 ft.

PORT NECHES—ORANGE COUNTY

The Texas Company's No. 1 Polk-Kuhn-Glass, 260 ft. E and 1,545 ft. S of SW cor. Marshall Beauchamp Sur., in the T. J. Notgrass Sur. ..... Coring sand 6,177 ft.

The Texas Company's No. 3 Polk, T. J. Notgrass Sur., 500 ft. NE of No. 2 Polk ..... Drlg. sticky shale 3,122 ft.

The Texas Company's No. 3 Kuhn, 587 ft. S and 150 ft. W of NE cor. of the Mary E. Hall Sur. No. 2 ... Drlg. sticky shale 3,497 ft.

ORANGE—ORANGE COUNTY

Sun Oil Co.'s No. 1 Belile (D.D.) ..... Cleaning hole to deepen 3,655 ft.

REFUGIO—REFUGIO COUNTY

Houston Oil Co.'s No. 1 Tom Heard (W.O.), Blk. 16, Townsite ..... Cutting and pulling liner 6,462 ft.

Houston Oil Co.'s No. 2 Rose Lambert (W.O.), SE cor. of tract, Townsite ..... Pulling liner to deepen 5,890 ft.

E. M. Jones' No. 1-B Mitchell (D.D.), 250 ft. NW of SE line and 250 ft. SW of Mission River ..... No report.

Larco Gas Co.'s No. 4 Strauch heirs, 150 ft. from N line and 150 ft. from W line, Lot 6, Blk. 2 ... Shut down 3,696 ft.

Moody-Seagraves Prod. Co.'s No. 2 O'Connor (W.O.),150 ft. from N line and 508 ft. from W line 62-acre tract ..... T.D. 6,454 ft.; to plug back.

Pearson Properties' No. 2 Ryals (W.O.), 600 ft. from S line and 150 ft. from W line of lease ..... T.D. 5,718 ft.; to deepen.

United Prod. Co.'s No. 5 Mitchell (W.O.), Refugio Townsite, 159 ft. from N line and 438 ft. from E line of tract ..... Rig up to work over 6,446 ft.

SOUTH LOUISIANA FIELDS
JENNINGS—ACADIA PARISH

Russell Campbell's No. 3 Syndicate (D.D.), 475 ft. S and 350 ft. W of NE cor. Sec. 41-9s-2w ..... Deepened from sand 1,793 ft. to sand 1,875-80 ft.; set screen.

Kathleen Oil Co.'s No. 1 Syndicate fee (W.O.), Sec. 46-9s-2w ..... Twisted off 4,025 ft.; shut down.

Reliable Oil Co.'s No. 2 Rawson (D.D.) ..... No report.

IOWA—CALCASIEU AND JEFF DAVIS PARISHES

Shell Petroleum Corp.'s No. 2 Heyd, 225 ft. out of NE cor. of Sec. 13-9s-7w ..... Drlg. sand and shale 6,083 ft.

Shell Petroleum Corp.'s No. 1 Fontenot, Sec. 7-9s-6w, 450 ft. due E No. 2 Heyd ..... Cmtd. csg. 5,146 ft.

EDGERLY—CALCASIEU PARISH

S. A. Emerson et al's No. 15 Hunter, Sec. 21-9s-11w, 265 ft. SE of No. 10 ..... Derrick.

LOCKPORT—CALCASIEU PARISH

Union Sulphur Co.'s No. 2 Martha Moss (W.O.), 120 ft. S and 56 ft. W of NE cor. SE NW of Sec. 8-10s-9w... Sand 6,650-66 ft.; set 1 jt. of 3-in. screen.

SULPHUR—CALCASIEU PARISH

Union Sulphur Co.'s No. 732 fee (W.O.), 965 ft. N and 2,065 ft. W of C of Sec. 29-9s-10w ..... Tested salt water 3,482 ft.; pulling screen to deepen.

Union Sulphur Co.'s No. 768 fee, 175 ft. N and 188 ft. W of SE cor. SW NW of Sec. 29-9s-10w ..... Cored sand 3,375 ft.

Union Sulphur Co.'s No. 769 fee, 295 ft. S, 918 ft. W of C of Sec. 29-9s-10w ..... Drlg. hard lime 3,140 ft.

VINTON—CALCASIEU PARISH

Gulf Ref. Co.'s No. 1 Gray (D.D.), 125 ft. W and 85 ft. N of SE cor. NE SE of Sec. 33-10s-12w ..... Drlg. gumbo 2,962 ft.

Marrs McLean's No. 13 Gray, 464 ft. E and 460 ft. S of C of Sec. 30-10s-12w ..... Drlg. sand and boulders 900 ft.

Vinton Petroleum Co.'s No. 1 Matilda Gray (20 acres), 48 ft. N and 89 ft. W of SE cor. SW NE of Sec. 23-10s-12w (D.D.) ..... T.D. 3,214 ft.; sidetracked 3,016 ft. to sand 3,053 ft.; cemented.

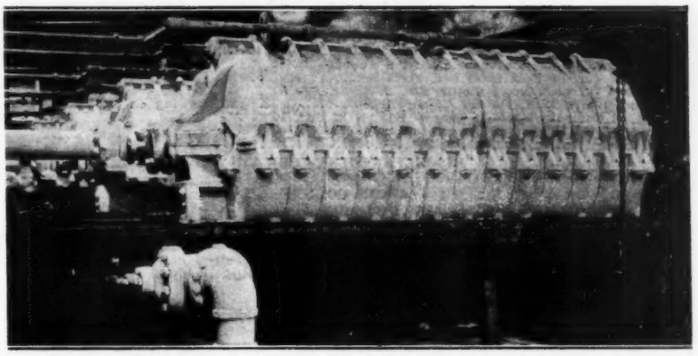
HACKBERRY—CAMERON PARISH

Calcasieu Oil Co.'s No. 23 Watkins (W.O.), 2,495 ft. W and 132 ft. N of SE cor. Sec. 13-12s-10w ..... T.D. 2,844 ft.; set whipstock 2,572 ft.; shut down.

J. G. Sutton's No. 5 Irwin (W.O.), 200 ft. N and 2,055 ft. W of SE cor. of NE Sec. 13-12s-10w ..... Pulling screen to work over 3,023 ft.

J. G. Sutton's No. 6 Irwin, Sec. 13-12s-10w ..... Location.

Union Sulphur Co.'s No. 1 Gulf land (Humble lease), 284 ft. N 30 ft. W of SE cor. Sec. 11-12s-10w ..... Sand 5,990-6,001 ft.; set 1 jt. of 4½-in. screen and 4 jts. liner; comp. flowing 1,400 bbls. P.L. oil, 900 lbs. pressure, 34.3 deg. (cor.) gravity.



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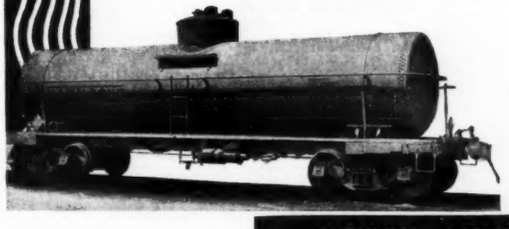

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Union Sulphur Co.'s No. 1 Gulf land (Pure Oil Co. lease), 1,420 ft. N, 400 ft. W of SE cor. Sec. 11-12s-10w ..... Drlg. shale 4,812 ft.

PORT BARRE—ST. LANDRY PARISH

W. A. Aggers' No. 1 Cochran, 250 ft. S and 250 ft. E of NW cor. of Fractional Sec. 31-6s-5e ..... Drlg. gumbo 2,676 ft.
Port Barre Oil Co.'s No. 1 Sibille, Sec. 29-6n-5e, 600 ft. S and 124 ft. E of NW cor. 30-acre tract ..... Sand showing oil 3,403 ft.
The Texas Company's No. 11 Botney Bay, N 82 deg. 10 min. W 474 ft. from NE cor. of tract and N 7 deg. 50 min. E 105 ft. in Sec. 4-6s-5e ..... Spudded.

MISCELLANEOUS WILDCATS

TEXAS

AUSTIN COUNTY

C. O. Farrington et al's No. 1 Jackson, Brookshire, S. F. Austin Sur. No. 16, 750 ft. NW of Empire Gas & Fuel Co.'s No. 1 Jackson and 250 ft. S of NW line... Cmtd. 10-in. csg. 60 ft.; standing.
Grant & Baker's No. 1 Chesley, W. C. White Sur., 150 ft. from NW line and 150 ft. from SW line of 26-acre tract (northeast of Raccoon Bend Field) ..... Sand rock 600 ft.
O'Hara Oil & Gas Co.'s No. 1 Neilius, J. C. Cummings Hacienda Sur., 650 ft. N of No. 1 Schroeder in 18-acre tract, north edge Mill Creek ..... Derrick.
Pomacal & Boletka's No. 1 Schebajsa, 329 ft. N, 78 deg. E of N cor. B. Dottery Sur., near center of SW line of S. F. Austin 4 League on west fork of Mill Creek.. Shut down 1,740 ft.
Vogelpohl et al's No. 1 Trenchman, J. Cummings Hacienda Sur., 319½ ft. from E line, 1,244 ft. from S line of 32¼-acre tract ..... Rig.

BRAZORIA COUNTY

John Deering's No. 1 C. W. Chapman, 294 ft. from S line and 104 ft. from E line of Lot 2, Andrew Robinson Sur. ..... Preparing to resume drlg. 1,514 ft.
The Texas Company's No. 2 Belcher, Manvel (D.D.), 1,728 ft. southeasterly and 1,231 ft. southwesterly at right angles out of N cor. of lease, Harvey Little Sur. ..... Killed well to deepen 5,602 ft.
United Oil Syndicate's No. 2 Levitt, John Peake Sur., 75 ft. NW of No. 1 ..... Drlg. gumbo 465 ft.

BURLESON COUNTY

Marek & Son's No. 3 A. Marek, N. McFaddin Sur., 1,068 ft. N and 325 ft. W of SE cor. of tract ..... Standing 2,210 ft.
M. O. & T. Corp.'s No. 1 Rigers ..... Shut down 2,050 ft.

FORT BEND COUNTY

O'Hara et al's No. 1 Brown, Pliant Lake, Wm. Barrett and Abner Harris Sur., 600 ft. out of SW cor. of Brown 600-acre tract ..... Drlg. shale and lime 2,486
Naylor & DeCosta's No. 1 Naylor, 4,350 ft. N, 55 deg. E from SW cor. 653-acre tract in Christman Sur. ..... Cmtd. 20-in. csg. 140 ft.

GRIMES COUNTY

Barnett et al's No. 1 Dodd, Timothy Jones Sur., 280 ft. N. Cobb & Rasmussen's No. 1 Dodd ..... Drlg. shale 1,796 ft.
Rianjo Oil Co.'s No. 3 Cuthrell, Patrick B. O'Connor Sur., 150 ft. S, 10 deg. E of No. 3 ..... Shut down 1,150 ft.
Stanolind Oil & Gas Co.'s No. 1 Mary Sullivan, A. Yeamen's Sur., 998 ft. out of SE cor. of 712-acre tract ... Drlg. sticky shale 1,772 ft.

HARRIS COUNTY

Flanigan et al's No. 1 Woodburn, Genoa, August Whitlock Sur., 200 ft. out of NW cor. of tract ..... Location.
Shubert & Alexander's No. 1 Herman Hale, 1,058 varas E of NW cor. R. A. Hanks Sur., thence 790 varas S and thence 70 varas W 74 deg. ..... Shut down 2,720 ft.

JACKSON COUNTY

Chicago Gulf Corp.'s No. 4 Druschell (W.O.) ..... Drlg. shale 4,270 ft.
Chicago Gulf Corp.'s No. 10 Druschell, Hayes Sur., 1,300 ft. NW of No. 3 ..... Drlg. shale 3,936 ft.

JASPER COUNTY

Hext Drlg. Co.'s No. 1 Flourney, B. F. Jones Sur., 900 ft. NW of Helmerich & Payne's No. 1 Flourney ..... Reported sand showing oil 3,997 ft.; cmtd. 6⅝-in. csg. 3,200 ft.

JEFFERSON COUNTY

Brown et al's No. 1 M. O. Todd, 200 varas S and 58 varas E of NW cor. of Wm. Carr Sur. ..... Gumbo 3,541 ft.; cmtd. 9⅝-in. csg. 3,524 ft.
John I. Pipkin and Elam's No. 1 Broussard, McGaffey Sur., 800 ft. from S line in center E and W of 205-acre tract ..... Drlg. 2,355 ft.
C. R. Tolliver et al's No. 1 Tolliver, Duches Sur., 3,500 ft. from W line and 1,500 ft. S of Pine Island Bayou.. No report.
Westbury Oil Co.'s No. 4 West, 450 ft. W and 4,210 ft. S of NE cor. of T. D. Yoakum Sur. ..... Abnd. 603 ft.

LIBERTY COUNTY

Devore Oil Co.'s No. 1 Finley, 10,500 ft. from E line and 2,000 ft. from S line of A. B. Hardin Sur. ..... Shut down 65 ft.
Hamm et al's No. 1 Harvard, Davis Hill ..... Gumbo 1,015 ft.; shut down.
J. T. May et al's No. 1 Dunman, J. C. Martin League.... Location.

MATAGORDA COUNTY

Dr. Griffith et al's No. 3 Baer, Big Hill, 5,000 ft. N, 3,000 ft. E from SW cor. of Seth Ingram Sur. ..... No report.
United North & South Oil Co.'s No. 1 Stoddard, J. C. Keller Sur., 150 ft. W and 545 ft. N of SE cor. Blk. 53, Buckeye Townsite ..... Corrected depth 7,328 ft.; sand. showing oil; trying to set 6⅝-in. csg. 7,770 ft.

MONTGOMERY COUNTY

Herman Heep et al's No. 1 Cartwright, 2,851.6 ft. southerly along W line from NW cor. of John D. Davis Sur. and thence 450 ft. from said line ..... Drlg. shale 4,350 ft.
Pevehouse Oil Co.'s No. 1 Sealey, Jas. Pevehouse Sur., 1,575 ft. N of N line of Horton & Woodson's 1,562-acre tract and 2,226 ft. E of W line of H.&W. 1,370-acre tract ..... Shale 3,950 ft.; reaming.
Strake Oil Corp.'s No. 2 South Texas Development Co., Theo. Slade Sur., 1,600 ft. S of No. 1 ..... Location.

NEWTON COUNTY

R. T. Briscoe et al's No. 1-A Joe Inman, 1,950 ft. E and 500 ft. N of SW cor. J. M. Scott Sur. ..... Shut down 1,795 ft.

ORANGE COUNTY

Altex Oil Co.'s (Veteran Oil Co.) No. 1 Reed, A. Nelson Sur. No. 1, 500 ft. from N line and 350 ft. from E line of tract ..... No report.
Crew Oil Co.'s No. 1-A Mansfield, 50 ft. E of No. 1 ..... Shut down 2,275 ft.

POLK COUNTY

Freeman et al's No. 2 Freeman ..... Shut down 3,142 ft.
T. B. Hoffer's No. 1 Saner-Ragly Lbr. Co., 300 ft. out of most northerly cor. of most easterly County School Land Abst. 271 ..... Shut down 1,517 ft.

REFUGIO COUNTY

Blanco Creek Oil Co.'s No. 1 Damaan, 150 ft. from N line and 150 ft. from W line of Blk. 14, Bonnie View Ranch Subd. ..... Shut down 4,627 ft.
J. C. Doxin's No. 1 Peck, 450 ft. S, 150 ft. E of NW cor. of S half of Sec. 24, Bonnie View Ranch Subd., Estaban Lopez Sur. ..... Shut down 100 ft.
Humble Oil & Ref. Co.'s No. 2 O'Connor, John Keating Sur., 12,625 ft. N of S line at right angles and 5,158 ft. W of E line at right angles ..... Drlg. shale 2,935 ft.

SAN JACINTO COUNTY

E. P. Edwards' No. 1 J. R. Bennett, Cold Springs ..... Shut down 750 ft.
Seven Wells Oil Co.'s No. 1 Foster Lumber Co., 3,000 varas from the E line and 2,000 varas from the S line of H. Alsbury Sur. ..... Location.

TRINITY COUNTY

John Deering's No. 1 J. B. Gibson ..... Shut down 2,017 ft.
Scientific Producers Co.'s No. 1 Thompson, I.&G.N. Sur. No. 47, 50 ft. out of NE cor. of H. K. Thompson 199-acre tract ..... Shut down 1,191 ft.

TYLER COUNTY

King Oil Co.'s No. 1 Caswell ..... Sand and shale showing oil 1,344 ft.; cem. 6-in. casing 1,218 ft.; standing.
Allied Pet. Co.'s (Texas Southern Pet. Co.) No. 3 Wilson, Mrs. E. Cherry Sur. No. 798, 1,500 varas from W line and 600 varas from N line ..... Shut down 5,025 ft.

VICTORIA COUNTY

Bunte et al's No. 2 Keeran, Martin DeLeon Sur., 200 ft. E of No. 1 ..... Derrick.
Houston Oil Co.'s No. 1-A McFaddin, 200 ft. from NE line, 240 ft. from SE line of I.R.R. Sur. No. 20 ..... Spudded.
T. B. Slick Estate's No. 2 McFaddin, J. Varian Sur., 3,500 ft. NW of No. 1 and 1,100 ft. NE at right angles to SW line of lease ..... Drlg. gumbo 1,260 ft.
The Texas Company's No. 4 McFaddin, 86 deg. E, 1,728½ ft. from NE cor. of Andrew J. Gray Sur. in John M. Rine Sur. ..... Drlg. gumbo 1,582 ft.

WALKER COUNTY

Hart Oil Co.'s No. 1 Thompson Lbr. Co., Jose Ortega Sur., 1,265 ft. S, 1,876 ft. W of SW cor. of J. B. Gibson's 71-acre tract ..... Shut down for repairs 2,090 ft.

WALLER COUNTY

McDaniel and associates' No. 1 Citizens State Bank, B.B.B.&C. Sur., C of 150-acre tract ..... No report.

SOUTH LOUISIANA

ASCENSION PARISH

McElroy Pet. Co.'s No. 2 Lacey, 150 ft. S, 150 ft. W of NE cor. of Sec. 29-10s-4e ..... Shut down 4,515 ft.

CALCASIEU PARISH

Crawford Doyle's No. 1 Johnson, Sec. 23-9s-13w ..... Shut down 875 ft.
L. O. Davis' No. 1 Industrial, Sec. 29-9s-10w ..... Standing 6,568 ft.
Hill Oil Co.'s No. 1 W. S. Vincent et al, 642 ft. W, 75 ft. N from SE cor., Sec. 25-10s-10w ..... Shut down 3,255 ft.
Wilfred Lahay's No. 1 Jardell, Sec. 16-10s-12w ..... Shut down 3,650 ft.
Success Oil Co.'s No. 1 Hewitt, 90 ft. out of SW cor., Sec. 11-9s-11w ..... Rig.

CAMERON PARISH

Brownie-Babbette Oil Co.'s No. 1 R. A. Moore, 562 ft. W, 50 ft. S of NE cor. E half SE of Sec. 18-12s-12w.. Drlg. gumbo 2,410 ft.

EVANGELINE PARISH

Emile LeDeau's No. 1 Vidrine, 260 ft. W and 350 ft. S of NE cor. of Sec. 47-3s-3e ..... Shut down 1,225 ft.

IBERIA PARISH

Jefferson Lake Oil Co.'s No. 29 Lake Peigneur, Sec. 58-12s-15e, 150 ft. W, NW of No. 28 in direct line with Nos. 26 and 28 ..... Abnd. sulphur test.
Warrick Oil Co.'s No. 1 Bernard, 912 ft. N and 150 ft. E of SW cor. Sec. 54-12s-7e ..... Rig.

IBERVILLE PARISH

Standard Oil Co.'s No. 2 Myrtle Grove-Wilbert, Bayou Choctaw, 2,040 ft. N and 600 ft. W of C of Sec. 52-9s-11e ..... No report.
Standard Oil Co.'s No. 2 Gay, Bayou Choctaw, 4,500 ft. N and 600 ft. E of SW cor. SE of Sec. 52-9s-11e..... Drlg. 5,175 ft.
Standard Oil Co.'s No. 7 Schwing, Bayou Blue, 1,359 ft. N and 1,856 ft. E of C of Sec. 74-9s-10w ..... Drlg. rock 4,735 ft.

LA FOURCHE PARISH

Pop Oil Co.'s No. 1 Esponge Vizier, Sec. 26-21-22e, 78 ft. N, 289 ft. E of The Texas Company's No. 4 L.L.&E. ..... Oil sand 3,711-19 ft.; cmtd. 6⅝-in. csg. 3,710 ft.
State Prod. Co.'s No. "D" W. H. Stark, 1,935 ft. S and 1,550 ft. W of NE cor. Sec. 72-16s-15e ..... Sulphur test.
The Texas Company's No. 4 L.L.&E., Leesville, Sec. 26-21s-22e ..... Sandy shale showing oil 3,722-46 ft.; cmtd. 7⅝-in. csg. 3,720 ft.; drlg. plug.

POINTE COUPEE PARISH

Grand Bay Oil & Gas Co.'s No. 1 Moniotte, 10,140 ft. S and 13,450 ft. E of NW cor. Twp. 5s-11 in Sec. 34.... Shut down 310 ft.

TERREBONNE PARISH

Freeport Sulphur Co.'s No. 1 Wurzlow, 1,200 ft. N and 2,600 ft. W of SE cor. Sec. 8-22s-18e ..... Drlg. 600 ft.
La. Gas & Fuel Co.'s No. 2 Minor, 3,480 ft. S and 1,980 ft. E of NW cor., Sec. 3-18s-16e ..... Drlg. 5,410 ft.
The Texas Company's No. 5 State, Dog Lake, 2,270 ft. S and 450 ft. E of NW cor. of Sec. 5-22s-16e ..... Drlg. 220 ft.
The Texas Company's No. 4 La.L.&E., Bay Junop ..... Location.
The Texas Company's No. 10 State, Lake Barre ..... Location.
The Texas Company's No. 12 State Lake Barre ..... Drlg. hard lime rock 3,906 ft.
The Texas Company's No. 14 State Lake Barre ..... Location.

VERMILLION PARISH

Pure Oil Co.'s No. 2 Alliance Trust Co., Gueydan 1,-875 ft. E and 950 ft. S of NW cor. of Sec. 34-11-1w... Drlg. sand 3,552 ft.

WEST FELICIANA PARISH

Putnam Synd.'s No. 3 Como Plantation, Sec. 51-1s-14w... Shut down 2,449 ft.

SOUTHWEST TEXAS PROVEN AREAS

(Continued from Page 44)

Houston Oil Co.'s No. 1 McGregor, 150 ft. from E line, 330 ft. from S line of 100-ac. tract in Sur. 211 ..... T.D. 4,260 ft.; set csg.
Kepley et al's No. 1 Speer and Hocker, 200 ft. from E and S lines of 350-ac. tract, in Speer and Driscoll lands ..... Spudded in.
Rutherford Drilling Co.'s No. 1 Hunter, 150 ft. from S and W lines of 10-ac. tract ..... Rigging up.
Saxet Oil Co.'s No. 5 Weil, 3,041 ft. to N line, 333 ft. to W line ..... T.D. 2,500 ft.; standing.
Saxet Oil Co.'s No. 6 Dunn, 600 ft. S of No. 5 Dunn, 4 miles W from Corpus Christi ..... T.D. 6,386 ft.; drlg.

ARANSAS POOL—SAN PATRICIO COUNTY

Atlantic Oil Prod. Co., to deepen to 6,000 ft. the Welder Oil Corp.'s No. 3 Welder ..... T.D. 3,689 ft.; to deepen.

LOS OLMOS POOL—STARR COUNTY

Bennett Oil & Gas Co.'s No. 1 Seabury et al, Porcion 75.. Moving in.
Coastal Oil & Gas Co.'s No. 1 Kelsey-Bass, 448 ft. to N line, 150 ft. to W line of Tract 52, Sur. 2, Porcion 86.. Location.
Davis et al's No. 3 Kelsey Bass, 150 ft. from N and W lines of W 10-ac. of SE NW of Sur. 6, Subd. of Porcions 75, 76 and 77 ..... T.D. 472 ft.; drlg.
Felder, Mitchell & Barnsley's No. 1 Kelsey Bass in Sur. 8, Subd. of Porcions 75, 76 and 77 ..... Rigging up.
Hooks and Weaver's No. 5 Kelsey-Bass, 525 ft. to S line, 150 ft. to W line of lease ..... Spudded in.
M. A. Landrum's No. 2 Kelsey Bass, 519 ft. from S line, 150 ft. from E line of Sur. 6, Porcions 75, 76 and 77.. Location.
Los Olmos Oil & Gas Co.'s No. 11 Kelsey-Bass ..... T.D. 260 ft.; standing.
J. A. Tarver's No. 1 A. K. Bass, 150 ft. from N and E lines of lease ..... T.D. 465 ft.; comp. 20 bbls.
M. A. Landrum's No. 1 A. K. Bass, Sec. 6, 150 ft. to S and E lines of lease ..... Location.
Los Olmos Oil & Gas Co.'s No. 9 Kelsey-Bass, 450 ft. from W line, 150 ft. from N line of SE SW of Sur. No. 6 ..... T.D. 502 ft.; comp. 30 bbls.
Los Olmos Oil & Gas Co.'s No. 10 Kelsey-Bass ..... T.D. 340 ft.; comp. 25 bbls.
R. H. Pursley's No. 1 Seabury, 150 ft. from E line, 4,125 ft. from S line of Share 5, of W two-thirds of Porcion 75 ..... T.D. 439 ft.; set csg.
Quien Sabe Oil & Gas Co.'s No. 3 Kusch, Share 11, W two-thirds of Porcion 75 ..... T.D. 270 ft.; drlg.
Rio Oil & Gas Co.'s No. 1 Kelsey-Bass (formerly carried as Los Olmos Oil & Ref. Co.'s No. 1 Kelsey-Bass) ..... T.D. 910 ft.; standing.

Rio Oil & Gas Co.'s No. 3 Kelsey-Bass, No. 6 Subd., Porcions 75, 76, 77 ..... T.D. 400 ft.; drlg.
San Marcos Oil & Gas Co.'s No. 7 Ivey, 450 ft. S of No. 6 Ivey ..... T.D. 480 ft.; drlg.
San Marcos Oil & Gas Co.'s No. 8 Ivey, 1,355 ft. from N line, 155 ft. from E line of Share 8, W two-thirds of Porcion 75 ..... Location.
San Marcos Oil & Gas Co.'s No. 9 Ivey in W two-thirds of Porcion 75 ..... T.D. 193 ft.; set csg.; waiting on cement.

WEST COLE POOL—WEBB COUNTY

French Oil Corp.'s No. 7 Benavides, 2,310 ft. from N line, 150 ft. from W line of Sur. 659 ..... Rigging up.

ESCOBAS POOL—ZAPATA COUNTY

E. R. Black & Paul S. Williams' No. 1 Comitas grant, 150 ft. from S and E lines of Blk. 100 ..... Location.
F. M. Blair & Son's No. 1 Montemayor, 450 ft. to N, 150 ft. to E line of Blk. No. 1, Sur. No. 63 ..... T.D. 810 ft.; drlg.
Daniels & Hill's No. 2 Montemayor, 112 ft. from N line, 774 ft. from E line of Blk. 7, Sur. 64 ..... T.D. 1,484 ft.; plugging back.
O. W. Killam's No. 5 Medina, 325 ft. from SE line, 480 ft. from NE line of Share 34 of Comitas grant ..... T.D. 200 ft.; drlg.
O. W. Killam's No. 18 Bustamente, 900 ft. to NE line, 863 ft. to SE line of Blk. 11, Share 5, of Comitas grant ..... T.D. 1,905 ft.; abnd.; comp. in Jan. as gasser at 1,735 ft.
W. M. Lee's No. 1 I. G. Trevino, 150 ft. from S and W lines of Blk. 7, Sur. No. 66 ..... T.D. 1,272 ft.; set csg.
D. M. Shaffer's No. 1 M. Garza, 150 ft. from NE and NW lines of Blk. 56, C. A. Douglas Subd. of Zerro ranch ..... T.D. 800 ft.; drlg.
Trevino Oil Corp.'s No. 1 M. Garza Estate, 150 ft. from NE line, 250 ft. from SE lines of Blk. 36, Douglas Subd., Comitas grant ..... T.D. 1,560 ft.; abnd.
Trevino Oil Corp.'s No. 16-A Trevino, 150 ft. from S and E lines of Blk. 14, Sur. 412 ..... Location.

CHARCO-REDONDO POOL—ZAPATA COUNTY

Bob & Richey's No. 28 Martinez, 990 ft. from SW line, 615 ft. from SE line, Blk. 24, Duke Subd., Charco Redondo grant ..... T.D. 175 ft.; comp. 2 bbls.
Bob & Richey's No. 29 Martinez, 810 ft. from SW line, 360 ft. from SE line of Blk. 24, W. R. Duke Subd., Charco Redondo grant ..... Location.

MARTINEZ POOL—ZAPATA COUNTY

F. H. Etheridge's No. 3 Winch & Henne, 160 ft. from W line, 200 ft. from S line of Blk. 10, Sur. 286 ..... T.D. 1,442 ft.; comp. 8,000,000 ft. gas, 340 bbls.

WILDCAT OPERATIONS IN SOUTHWEST TEXAS

(Continued from Page 44)

Smith & Capps' No. 1 Duval ranch lands, 150 ft. from SW and SE lines of Sur. No. 574 ..... Derrick.
Suttle et al's No. 1 Bennett, 150 ft. from N and E lines of Sur. No. 44 ..... Spudded in.
R. A. Thompson's No. 1 Parr, 2,640 ft. to W line, 12,160 ft. to S line of San Andres grant ..... T.D. 3,922 ft.; drlg.

FAYETTE COUNTY

A. D. Becker's No. 1 fee, 972 ft. from N line, 700 ft. from W line of tract in Williamson Sur. ..... Location.

GUADALUPE COUNTY

Barnhill et al's No. 1 H. L. Hoffman, 450 ft. to N and W lines of farm, in John G. King Sur. ..... T.D. 850 ft.; S.D.
Darst Oil Co.'s No. 1 Hamilton, 1,295 ft. from NW line, 150 ft. from SW line of 40-acre tract in J. H. Williamson Sur. ..... T.D. 2,545 ft.; abnd. in chalk.
Luling Oil & Gas Co.'s No. 1 J. D. Brown, 160 ft. from N line, 450 ft. from E line of tract in C. Wall Sur. ..... T.D. 2,500 ft.; drlg.
Tidal Oil Co.'s No. 1 Black, 1,231 ft. from NW line, 150 ft. from NE line of Valentine Bennett Sur. ..... T.D. 2,540 ft.; drlg.

GOLIAD COUNTY

Hoffman & Gooch's No. 1 Fromme, 600 ft. from N and 1,200 ft. from W line of Peter B. Dexter Sur. ..... T.D. 2,279 ft.; cleaned out; on bottom; drlg.
Plymouth Oil Co.'s No. 1 Parks, 5 miles NE Goliad ..... T.D. 4,625 ft.; abnd.
Neal et al's No. 1 J. M. Pettus, 10,700 ft. to S line, 2,500 ft. to E line of Pedro Trevino Sur. ..... T.D. 4,565 ft.; standing.

GONZALES COUNTY

Crowder Oil Co.'s No. 1 Preston, 1,000 ft. from W line, 2,000 ft. from N line of W. W. Pace Sur. ..... T.D. 200 ft.; standing.
Edmiston & Kirby Petroleum Coo's No. 1 J. W. Ward, Jr., 200 ft. from N and W lines of tract in Dan McKay Sur. ..... Derrick up; moving in tools.
Johnson & Mattock's No. 1 J. James, 12 miles NE of Gonzales city, 900 varas from E line, 300 ft. from S line of tract in M. A. Williams Sur. ..... T.D. 545 ft.; standing.
Nassaner, Gordon & Waldrop's No. 1 B. Bottis, 2,500 ft. from E line, 650 ft. from S line in Sec. 6, Blk. 56, Gonzales Sur. ..... T.D. 950 ft.; standing.

HIDALGO COUNTY

Barrett-Kanellos' No. 1 J. B. Brock, 7 miles W and N from Mission (on Monte Cristo road) ..... T.D. 3,944 ft.; drlg.
LaJoya Oil & Gas Co.'s No. 1 W. L. Hart, 6 miles W from Mission, north of San Fordyce ..... T.D. 4,500 ft.; standing.
Dayle L. Smith's No. 1, 18 miles W from Edinburg ..... T.D. 4,026 ft.; standing, showing gas.
San Roman Oil Co.'s No. 1 J. T. Lomax, 7,500 ft. from S and E lines of San Roman Sur. ..... T.D. 2,500 ft.; S.D.
Dayle L. Smith's No. 3 Daskam, SW part of county ..... T.D. 1,370 ft.; drlg.

JIM HOGG COUNTY

L. W. Connor's No. 1 Holbien, 150 ft. from N and E lines of Blk. 7, Sur. 7, Holbien Subd. of Las Animas grant ..... T.D. 1,846 ft.; preparing to test.
T. P. Morgan's No. 1 fee, 2,223 ft. to N line, 1,640 ft. to E line of Share 19, Palo Blanco grant ..... T.D. 4,100 ft.; drlg.

JIM WELLS COUNTY

Vacuum Oil Co.'s No. 1 Seeligson, 4,500 ft. to W line, 75,000 ft. to S line of Los Jabonclillos Sur. ..... T.D. 4,933 ft.; testing sand.

KARNES COUNTY

A. E. Edmiston's No. 1 O. L. Cochran, 150 ft. from S line, 500 ft. from E line of farm in D. B. McConnell Sur. ..... T.D. 1,820 ft.; standing.
Pickett et al's No. 1 D. E. Lyons in Victor Blanco Sur. ..... Rigging up.

KENDALL COUNTY

Dixon Oil Co.'s No. 1 Ottmar Behr, 823 ft. from S and N lines of Jessie Wilson Sur., 3 miles S of Sisterdale ..... T.D. 2,708 ft.; standing.
Fred S. Dibble's No. 1 Ellebrach, Sur. 77, N part of county ..... T.D. 50 ft.; S.D.

KERR COUNTY

George Ball's No. 1 F. A. Karger, 3 miles north of Kerrville ..... Rig on ground.
Evans & Gant's No. 1 E. Young, A. E. Burge Sur. No. 28 ..... T.D. 1,312 ft.; standing.
Evans & Gant's No. 2 Love, 150 ft. S and W line of Sur. 1,593 ..... T.D. 5,871 ft.; recementing to shut off water.
Verde Oil & Gas Co.'s No. 1 J. D. Witt, 1,320 ft. from N line, 1,220 ft. from W line of Sec. 1,923, Hamilton Sur., 4 miles S from Center Point. T.D. 200 ft. Carried to this depth and abandoned as Herber Oil Co.'s No. 1 J. D. Witt ..... T.D. 270 ft.; drlg.

KLEBERG COUNTY

H. Carter et al's No. 1 R. H. Simmons, in Sec. 7, King Sur. No. 3 ..... T.D. 2,908 ft.; drlg.

LIVE OAK COUNTY

Coastal Oil Finding Co.'s No. 1 Handley, 1,200 ft. from SE line, 400 ft. from SW line of tract in C. S. Cobb Sur. ..... T.D. 5,899 ft.; abnd.
J. A. Harper's No. 1 fee, 2,130 ft. to N line, 510 ft. to E line of farm, J. Pointevant Sur. No. 37 ..... Spudded in and standing.
Henderson Coquat's No. 1 Hewitt, 250 ft. from N and E lines of SW of Sec. 5, Thomas Adams Sur. ..... T.D. 1,785 ft.; S.D.
Henderson Coquat's No. 2 Sanger, 1,280 ft. NW of No. 1 Sanger ..... T.D. 3,012 ft.; drlg.

LEE COUNTY

Henderson & Holden's No. 1 Dismuke, 600 ft. to E line, 150 ft. to N line of farm, J. Maxmilian Sur. ..... T.D. 2,500 ft.; abnd.
A. H. Wheeler and associates' No. 1 fee, Blk. 47, H. Donohue Sur. ..... T.D. 3,890 ft.; abnd.
C. B. Polk et al's No. 1 Stoltz, Hiram Donohue Sur. ..... T.D. 2,300 ft.; abnd.
Chadwick et al's No. 1 Hickey, 1,000 ft. to NW line, 300 ft. to NE line of farm in Varreiman Sur. ..... T.D. 1,500 ft.; abnd.
Washington-Lee Oil Co.'s No. 1 L. Hicket, 1,100 ft. from N line, 200 ft. from E line of tract in J. D. Varreiman Sur. ..... Location.

McMULLEN COUNTY

Jacob Buzzini & Pickett's No. 2 Jacob, 150 ft. NW of No. 1 Jacob ..... Rigging up.
V. G. Shimmel's No. 2 Hale, 300 ft. S of No. 1 Hale ..... T.D. 1,500 ft.; abnd.

MAVERICK COUNTY

I. N. Boicourt's No. 1 Bandera, School Land ..... T.D. 2,300 ft.; abnd.

MEDINA COUNTY

Frank A. Brown's No. 1 Fohn, 150 ft. from E line, 790 ft. from N line of J. F. Torry Sur. No. 113 ..... T.D. 922 ft.; twisted off drill stem, fishing.

MILAM COUNTY

H. W. Elliott's No. 1 Marek, 767 ft. from N line, 500 ft. from W line of 160-ac. tract in B. Wickson Sur. ..... T.D. 3,000 ft.; S.D.
Red Bank Oil Co.'s No. 2-A J. A. Foster, 5,243 ft. to SW line, 150 ft. to NW line of farm ..... T.D. 5,403 ft.; abnd.
Frank A. Yeager's No. 1 Hose, 750 ft. from E line, 150 ft. from S line of lease in E. Allen Sur. ..... T.D. 1,675 ft.; going on pump.

NUECES COUNTY

Camp and Stanolind Oil & Gas Co.'s No. 1 King, 600 ft. to N and W lines of Sec. 23, Richard King farm lots subd. ..... T.D. 3,187 ft.; drlg.
C. E. McCarthy's No. 1, W. of Corpus Christi ..... Making location.

REAL COUNTY

McGinley Corp.'s No. 1 Haby, C of SW, Sec. 175 ..... T.D. 2,530 ft.; standing.

SAN PATRICIO COUNTY

John F. Camp's No. 1 Jackson, SW cor. of SW Sec. 30, 3 miles N from Edroy ..... T.D. 3,885 ft.; drlg.

STARR COUNTY

Davenport et al's No. 1 Wells, 30 miles W of Mission ..... T.D. 1,093 ft.; casing stuck.
R. E. Johnson's No. 1 Goodrich, 1,214 ft. from N line, 1,065 ft. from W line of tract, 1½ miles N of Rio Grande City ..... T.D. 1,380 ft.; set csg.
Strauch Oil Corp.'s No. 1 M. E. Salinas, 155 ft. from N and W lines of lease in Porcion 80, Share 38 ..... T.D. 1,540 ft.; drlg.
R. B. Suttle's No. 1 Guerra, 2,000 ft. to N line, 270 ft. to W line of Porcion 110 ..... T.D. 810 ft.; no report.
Jack Tarver's No. 1 Guerra, NE of Rio Grande City ..... T.D. 340 ft.; drlg.
Jess Williams' No. 1 Welsh, 1,120 ft. to W line, 1,500 ft. to N line of tract in Pedernal grant ..... T.D. 667 ft.; drlg.

TRAVIS COUNTY

C. R. Franklin et al's No. 1 J. Wilson, 160 ft. from N and W lines of farm in A. Alexander Sur. ..... T.D. 1,210 ft.; S.D.
Ray & Henze's No. 1 Hatech, in C of tract in S. Hamilton Sur. ..... T.D. 900 ft.; S.D.
Ray & Orth's No. 1 Lundgren, 550 ft. from N line, 150 ft. from W line of 133-ac. tract in L. Kimbro Sur. ..... Location.

WEBB COUNTY

O. W. Killam's No. 4 Bruni, 5,050 ft. to NE line, 7,675 ft. to SE line of El Ranchito tract, J. V. Borrego grant ..... T.D. 1,606 ft.; drlg.
Norden & Morris' No. 1 Gates, 160 ft. from E line, 50 ft. from S line of Blk. 5, Sur. 19 ..... Location.
Power & Dettenhalm's No. 1 Cowan & Goss, 1,870 ft. from W line, 1,656 ft. from N line of Sur. No. 1,606 ..... T.D. 405 ft.; standing.
Fansler, Johnson & Peacock's No. 1 Laurel, 425 ft. to N line, 600 ft. to E line of Blk. 10, Sur. 271 ..... T.D. 2,195 ft.; drlg.
W. R. Shankle's No. 1 Ellison Furniture & Carpet Co., 150 ft. from SW and NW lines of Blk. 2, Sur. 466 ..... T.D. 2,198 ft.; testing.

WILLIAMSON COUNTY

McLean et al's No. 2 R. C. Miller, 800 ft. to S line, 100 ft. to W line of tract in B. Manlove Sur. ..... Rigging up.
McNeil et al's No. 1 W. R. Lane, 450 ft. from NW line, 150 ft. from SW line of 108.4-ac. tract, in T. E. Shell Sur. ..... Set one joint surface pipe.
G. B. Peterman's No. 1 Galler, 1,800 ft. from S line, 150 ft. from W line of 140-ac. tract in H.Y.&B.R.R. Sur. ..... T.D. 1,493 ft.; set csg.

ZAPATA COUNTY

Ballard & Mercer's No. 1 Flores, 500 ft. from NE line, 580 ft. from SE line of Blk. 27, Porcion 37 ..... T.D. 2,170 ft.; drlg.
George Ball's No. 1 Gutierrez in Charco Redondo grant, taken over from Moore et al to deepen ..... T.D. 2,065 ft.; drlg.
Joe Cullinan's No. 1 E. Gutierrez, 1,992 ft. from NE line, 2,033 ft. from SE line of Charco de la India grant ..... Location.

ZAVALLA COUNTY

Carpenter & Jenkins et al's No. 1 John Wolf, Sec. 8, Abstract 1,199 ..... T.D. 767 ft.; setting csg. to test show of gas.

WILDCAT OPERATIONS IN OKLAHOMA

(Continued from Page 39)

HASKELL COUNTY

Ault et al's No. 1 Hall, NW SW SW Sec. 14-9-19 ..... S.D. 2,000 ft.
Ault et al's No. 1 Hall, SE NW Sec. 25-19-9 ..... S.D. 200 ft.

KAY COUNTY

Bluebaugh et al's No. 1 Indian, C NW NE Sec. 30-25-1 ..... Drlg. 1,210 ft.
Harris & Haun's No. 1 Watson, SW NW Sec. 28-28-1w ..... Drlg. 2,760 ft.
Lewis et al's No. 1 Harris, SE NW Sec. 14-25-1 ..... Location.
Mummert Drlg. Co. et al's No. 1 Cormick, C NW SE Sec. 9-27-2 ..... S.D. 3,693 ft.
Blackwell Oil Co.'s No. 1 Harshman, Sec. 2-26-1w ..... Rig on ground.

KIOWA COUNTY

Christian's No. 1 Jones, NE SE Sec. 8-7-13w ..... Running csg. 852 ft.

LATIMER COUNTY

P. English's No. 1 Unknown, NW SE Sec. 16-6-19 ..... S.D. 1,542 ft.

LINCOLN COUNTY

Hilton Phillips' No. 1 Phillips, SW NW, Sec. 2-14-3 ..... Drlg. 3,920 ft.
Mote et al's No. 1 School Land, NW cor. Sec. 36-17-5 ..... S.D. 1,430 ft.

OKLAHOMA COUNTY

Citizens Oil Co.'s No. 1 Sage Barber, NE cor. Sec. 21-11-3w ..... S.D. 1,200 ft.
L. C. Hivick's No. 1 Sunset Addition, NW SW NW Sec. 17-11-3w ..... S.D. 5,515 ft.

PAWNEE COUNTY

Rookstool's No. 1 Wylie, NW NE SW Sec. 6-20-5 ..... S.D. 1,950 ft.

PITTSBURG COUNTY

Ruby Ann Oil Co.'s No. 1 George, CEL NW SE, Sec. 3-4-16 ..... Drlg. 450 ft.
Tape Oil Co.'s No. 1 Fulton, SE Sec. 34-7-14 ..... S.D. 1,700 ft.
J. Morrison's No. 1 Fowler, NE SE Sec. 13-7-17 ..... Rig.
C. Kennedy's No. 1 Travis, C SW NE Sec. 15-7-14 ..... Rig.
C. Canady's No. 1 Jones, NW cor. Sec. 14-8-14 ..... Rig.

POTTAWATOMIE COUNTY

Clara Oil & Gas Co.'s No. 1 Unknown, SW NW NE, S.c. 1-9-4 ..... Location.
Barnsdall et al's No. 1 Gray, NE SW Sec. 25-6-4 ..... Drlg. 2,770 ft.

ROGER MILLS COUNTY

Ute Oil Co.'s No. 1 Williams, C SW Sec. 23-12-24w..... S.D. 5,150 ft.
L. C. Hivick's No. 1 Davis, C NW NE Sec. 4-11-26w..... S.D. 3,420 ft.

WASHITA COUNTY

Miley Pet. Co.'s No. 1 Wolfe, NE SW Sec. 23-9-17w ..... Rig.
Cooper & Terhune's No. 1 Blocker, NW cor. Sec. 29-8-19w ..... Drlg. 2,740 ft.; show oil 2,459-67 ft.; S.D. 2,757 ft.
Burns & Prince's No. 1 Deck, SW cor. Sec. 21-8-18 ..... S.D. 1,265 ft.

OKLAHOMA PANHANDLE

TEXAS COUNTY

Three Way Oil Co.'s No. 1 Crane, SW NW Sec. 11-1-18.. T.D. 4,720 ft.; to cement.

SOUTHERN OKLAHOMA

ATOKA COUNTY

Brookshire's No. 1 R. W. Rowland, NW NE SE Sec. 18-3s-10 ..... S.D. 1,720 ft.

BRYAN COUNTY

Bryan County Oil's No. 1 Childs, NW SE SW Sec. 7-7-10.. T.D. 650 ft.
Bush et al's No. 1 Commerce Trust, NE cor. Sec. 35-6s-9 ..... T.D. 740 ft.; plugged back to 459-80 ft.

CARTER COUNTY

Lundy's No. 1 Spraggins, C NE NW SW Sec. 8-1s-2w .... S.D. 2,500 ft.

JEFFERSON COUNTY

Smith's No. 1 McCarty, SE NW NE Sec. 18-4s-8w ..... Location.

MARSHALL COUNTY

Starrett et al's No. 1 Henry, NE NW Sec. 22-7s-6 ..... Spudding.
Everett et al's No. 1 Agres, SE NE Sec. 14-7s-6 ..... S.D. 1,170 ft.
Newman et al's No. 1 Henry, NW cor. Sec. 22-7s-6.... Rig.

McCURTAIN COUNTY

Prassell et al's No. 1 Wagoner, SE NE Sec. 5-8s-27..... S.D. 340 ft.
Stampfs et al's No. 1 Harris, SW NW SW Sec. 14-9s-25.. S.D. 2,731 ft.
Stewart's No. 1 Patterson, C SE SE Sec. 7-6s-24 ....Drlg. 1,411 ft.

PUSHMATAHA COUNTY

Whitehead et al's No. 1 Messer, SE SW SW Sec. 35-3s-18 ..... Fishing 1,030 ft.

STEPHENS COUNTY

Brown's No. 1 Hightower, SW SE NE Sec. 15-3s-5w..... Sand 990-1,004 ft; S.O; S.D.
George's No. 1 Ryan, NW SW NE Sec. 31-3-15w..... S.D. 510 ft.

CANADIAN FIELDS

(Continued from Page 46)

ence of similar oil shows over so large an area was regarded as a hopeful indication for commercial discoveries in the border fields.

Hudson's Bay Oil & Gas Co.'s No. 1 Keho, LSD 2, Section 17-11-22w4, the northernmost of the three tests, which got its oil show at 4,920 feet, has been cemented back and is waiting for milder weather to sidetrack lost tools and redrill the oil sand in the Madison. Work will probably be resumed in April.

Parco Oil Co.'s No. 1, LSD 16, Section 34-1-20w4, on the Twin River structure, is the southernmost of the three tests and fairly close to the Montana boundary. A pumping test of the oil sand below 3,870 feet indicated a fairly steady production of around 10 bbls. a day. A small shot was tried, which apparently failed to improve the oil flow, but let in a small amount of water from the lower horizon which had previously been cemented off. This has been recemented and the well is being again tested on the pump to definitely determine the actual results of the shot. A second shot may be tried.

It is possible further commercial drilling may be undertaken on this structure. Parco's No. 1 was drilled on Nordon Corp. acreage, and Sudbury Drilling Co. has recently completed a series of structure tests for the two companies on the Twin River structure. The results will probably throw some new light on structural conditions.

Border Fields

East of Coutts, Mayland Southern's No. 1 wildcat, LSD 13, Section 4-1-9w4, on the international Reserve Dome structure, is expected to resume drilling in April. The test, started in February, 1931, was carried last year to 2,750 feet, developing an aggregate flow of around 11,000,000 feet of gas from sands at 1,807 feet, 1,890 feet, 2,180 feet and 2,592 feet, with smaller flows in the upper sands. The results so far secured indicate a fairly important gas field on the Canadian end, but the test is to be deepened several hundred feet for oil.

On the Milk River structure, Commonwealth Petroleums' No. 1, LSD 8, Section 9-3-15w4, is also expected to resume in April. The test is bottomed at 5,240 feet, at which depth it had been cored through the Devonian lime into a shale formation. An oil horizon is thought possible between 5,500 and 5,600 feet, and the test will likely be carried to this depth at least.

On the Montana side, Blackfeet Petroleum Co. is reported to be taking over the W. M. Fulton oil holdings in the western Montana fields. These include the unfinished test of Fulton Oil Co., which is reported standing at 2,900 feet, and which the new owners will complete with rotary outfit under contract.

Red Coulee Field

On the Alberta end of the Red Coulee structure, Devonshire Oils' No. 1, LSD 3-4, Section 10-1-16w4, north of the Vanalta producers, is cleaning out, preparatory to deepening from 1,930 feet. O. R. Long has the contract to complete the well, and production is expected around 2,550 feet.

On the Montana side, Askalta Oils' No. 3 has been located offsetting Askalta's No. 1 producer. Work will commence early in April. Askalta's Nos. 1 and 2 are reported making around 250 bbls. a day.

South Turner Valley

In the South Turner Valley, Miracle Oils' No. 3, LSD 11, Section 4-19-2w5, is preparing to build new derrick, replacing that destroyed by fire when pressure increased suddenly as a result of gas freezing in the pipe between the well and the separator. The well is apparently little damaged. The tools were only 14 feet off bottom and can likely be recovered without much trouble. Robert Cameron, who was seriously injured in the explosion, is reported making satisfactory progress at the Calgary hospital. Damage to derrick and tools is estimated around $30,000. Miracle's No. 3 was about 670 feet in the limestone at 6,150 depth, with a showing of 50 gravity crude good for between 15 and 20 bbls. a day. The well will likely be drilled deeper.

Hylo Oils' No. 1, LSD 12, Section 4-19-2w5, has started drilling into the lime after cementing 6¼-inch casing on top of the lime at 5,501 feet. While the hole was standing, gas pressure from the Home sands at 4,955 feet built up to a point where the well started to flow by heads, one head making 300 bbls. The test has been bailing around 90 bbls. a day while drilling.

Tests in the Foothills

With the approach of milder weather, the scattered tests in the Alberta foothills are showing renewed activity. On the Monarch structure some 75 miles northwest of Calgary, Cartier-Majestic's No. 1, LSD 3, Section 36-31-7w5, is bottomed at 1,140 feet, and has finished running 8¼-inch casing, preparatory to making new hole.

In the Fisher Creek area, Cotton Belt Mines' No. 1, LSD 5, Section 21-21-4w5, which has been standing at 2,625 feet, is reported resuming after the winter. The test had several shows in the upper horizons, including a fairly strong gas flow at 2,070 feet in a sand thought to be the Dalhousie. The area is a northwesterly extension of the Waite Valley Field, but the structure is thought to be considerably higher at this point.

On the Moose Mountain structure, Elbow Oils' No. 1, LSD 11, Section 35-22-5w5, is securing water supply for cementing a crevice which has interfered with drilling. The hole is down to 3,340 feet and will be plugged back and straightened.

To Reopen Old Field

Calgary and Lethbridge capital is interested in a new company being organized to reopen Alberta's first oil field at Waterton National Park. The area, at that time a practically untraversed wilderness, was first tested about 1902 when Alex Calvert of Petrolia drilled a well for the Rocky Mountain Development Co. The test, according to Calvert, got production on September 21, 1902, at a depth of 1,020 feet, flowing for some days at a rate of at least 300 bbls. a day. Location was in NE Section 30-1-30w4. The well produced on a declining scale for some time, but the tools were lost and ultimately production was shut off or petered out. A number of drilling tests were actually started, and at least one other well got some production. The nearest Canadian refinery was, however, at Sarnia, Ontario; and owing to transportation difficulties and lack of a market, the excitement eventually died down.

A. P. Patrick of Calgary, associated with John Lineham in the original Rocky Mountain Development Co., made several attempts to revive the old field. In 1914 the Original Discovery Oil Co. started to clean out No. 1, but the work was not finished, though some production was brought back for a time.

The area was later investigated by E. H. Cunningham Craig, who reported favorably on the prospects; and last summer it was also examined by Dr. Simon Papp and Dr. James Templeton, who also made a favorable report. Mr. Cunningham Craig states that "there is no doubt whatever that oil will be struck, but in what quantity can only be proved by the drill. The extent of the field also is a question about which it is impossible at present to make more than a guess." With the oil horizon at only 1,000 feet, quick results are looked for. The drilling operations of the new company will be looked after by Alfred W. Patrick, son of A. P. Patrick. Larry F. Patrick and Miss Theo. F. Grewer are also associated with the new company. Work will probably be started early this spring. The location is in an area where oil seepages were known long before the first drilling; and a pioneer squatter, Bill Aldridge, for a number of years made a living by skimming oil from the creeks, refining it in a primitive type of still, and selling it is an illuminant and medicine to the Mormon settlers about Cardston.

Manitoba Gas Test

In the Manitou district, southwestern Manitoba, Commonwealth Petroleums' No. 2, LSD 2, Section 26-2-9wPM, is drilling below 1,535 feet on a test for gas.

British Columbia Test

In British Columbia, Kelowna interests are arranging for completion of Okanagan Oil & Gas Co.'s No. 1, Section 2-26-Osoyoos, to a potential oil horizon at 3,000 feet. The test was originally started by E. G. McKenzie & Co. of Vancouver, but has been carried on by the Okanagan Oil & Gas Co. to a depth of about 2,350 feet. Drilling outfit was lent by the Okanagan Drilling Co. in return for a stock consideration. The test, which is reported to have cost around $82,000, has been partially financed by shareholders in the Okanagan Valley to the extent of $41,392. The company's geologist, Julius Rickert, expects production around 3,000 feet, and Homer S. Cribb, head driller, is taking a contract for the labor costs at $10 a foot.

Drilling in Ontario

In Lambton County, Ontario, Michigan-Pacific Oil & Gas Co.'s No. 1, Lot 10, Concession 12, Brooke Township, is officially reported to have struck a small show of oil in the bottom of the lime at 2,005 feet and is drilling deeper. The test had previously passed through salt between 1,430 and 1,910 feet after failing to get oil in the shallow horizons. Gas was looked for in the deeper drilling, in horizons corresponding to those of the Newbury and Dawn Fields.

West of the Dawn Field, in Lambton County, Dawn Oil & Gas Co.'s No. 1, Lot 25, Concession 9, Sombra Township, is running 6⅝-inch casing to about 1,190 feet, and is expected to reach the Dawn gas sand in about a week.

In Enniskillen Township, Sarnia Oil & Gas Co. is reported to have a fishing job in an old well of the Oil Springs Oil & Gas Co. which was being cleaned out.

EASTERN FIELDS

(Continued from Page 53)

trict, W. H. Bickel has a rig standing on the George D. Starkey farm.

In Lincoln County the Vernon Gas Co. is spudding in for a second test on the Roy and Hal Adkins farm in Union district. In Jefferson district, the Parner Gas Co. is drilling on the A. and E. Elkins farm and has reached 1,330 feet. In the same district the Cambridge Gas Co. is still fishing for tools in its second test on the A. M. farm and at a depth of 1,765 feet. In this district, the Turtle Lick Gas Co. has made a location on the J. F. Johnson farm. In Sheridan district, H. H. Dial is shut down temporarily for repairs on the Claude Peyton farm at 1,900 feet. The Kanawha Gas & Utilities Co. has made a location on the Byron Johnson farm, Sheridan district. In Carroll district, the same operators have a location for No. 3 on the W. W. Carroll farm.

In Cabell County, the Madison Gas Co. is spudding in on the Era Taylor farm in Guyandotte district. In the same district Wilson and Mowery have reached 200 feet in a second test on the Hans-Watts Realty Co. lease.

In Logan County the West Virginia Gas Co. has plugged and abandoned its No. 36 on the Dingess Run Coal Co. tract in Logan district after reaching 2,376 feet. The tools were lost in the hole and a location was made for another well which will be given the same number. In Chapmasville district, the Cumberland Petroleum Co. is down to 1,247 feet in No. 5 on the Merrill Coal Co. tract and has shut down for repairs.

In Boone County the Pure Oil Co. is shut down at 2,249 feet in No. 56 on the Federal Coal Co. tract in Sherman district and is testing that formation for gas. In Scott district the Cambridge Gas Co. is drilling a second test on the C. C. Lewis heirs farm and has reached 1,189 feet. In Washington district, the second test of the Hill Gas Co. on the J. Albert Covert farm is shut down at 793 feet for repairs.

SOUTHWEST PENNSYLVANIA

There were two completions in Southwest Pennsylvania, both gas wells. In Greene County, the Scheidler-Johnson Co. completed a test on the Myrtle Sterling farm in Dunkard Township at 2,400 feet, in the Dunkard sand. It is showing for a fair gas well. In Washington County the Carnegie Natural Gas Co. completed a test on the Lizzie Plants farm in East Finley Township in the 30-foot sand. It is a gas well rated at about 180,000 feet of gas a day. This test is close to territory which has been producing somewhat larger volumes and is regarded as disappointing.

In Allegheny County, C. S. Parks and others have made a location for a second test on the J. D. Burg farm in Alleppo Township. No. 1 started off at 5 bbls. after shot. In Whitely Township, Greene County, the Equitable Gas Co. is drilling on the Ed Cowell farm which has reached a depth of 2,245 feet.

H. R. HALL DIES

Henry R. Hall, long a resident in Mexico City, and the most prominent American lawyer in the capital, dropped dead of heart disease as he was leaving the British Hospital after visiting a sick friend.

Mr. Hall, a native of St. Louis, Mo., for several years was secretary of the Association of American Producers of Petroleum in Mexico and at his death was legal representative of the Standard Oil Co. of New York.

Jersey Company Adopts Octane Basis

Establishes Quarter Cent Differential for 65 O. N. Gasoline. Bunker "C," Furnace Oils and Domestic Diesel Oil Posted Prices Are Advanced

By A. E. Mockler

New York Bureau, The Oil and Gas Journal, Rooms 1919-21, No. 154 Nassau Street

NEW YORK, Mar. 28.—The outstanding feature of the eastern refined products markets during the past week was the announcement by Standard Oil Co. of New Jersey that, effective March 23, it had established an octane basis for its tank car gasoline sales. The company posted a price of 5¾ cents for 60 octane number motor gasoline and 6 cents for 65 octane number motor fuel, with its "Standard" gasoline, of better than 65 octane number, posted at 6¼ cents, these quotations applying to tank car shipments from the company's bulk terminals at Bayonne, Baltimore, Norfolk and Charleston. The quotations are in line with the general market on the lower grade of gasoline, but are one-quarter to one-half cent under top posted prices by other refiners on the higher antiknock rating products.

It was a week of constructive developments throughout the general market, topped by the mark-up in crude prices announced on Thursday. Refinery prices for furnace oils for refinery shipment and Diesel oil for tank car delivery to share installations were advanced one-half cent per gallon, bunker "C" posted prices moved up 5 cents per barrel and tank wagon and service station gasoline prices were advanced throughout a large part of the territory. Gallonage on the major products continued to run into substantial totals, and indications pointed to a better price basis for the general line of major refined products during the quarter just about to get under way.

While the East experienced continued cold weather during the greater part of the week, conditions were favorable for motoring, and there were sharp increases in gallonage reported in both tank wagon and refinery markets. Cold weather also had the effect of substantially stimulating furnace oil sales.

With preparations completed for landing large quantities of South American and Mexican crude and products in the United States during the next few weeks, the eastern oil trade has become more or less apathetic toward the tariff outlook, with refiners marking time pending definite word from Washington.

Refinery Gasoline

Announcement by Standard Oil Co. of New Jersey that its tank car gasoline sales would henceforth be made on an octane basis aroused considerable interest in refinery market circles, and it is generally believed this action is a forerunner of similar action by other major units. The step by the New Jersey company readjusts the posted range at several points on the Atlantic Seaboard, making the Baltimore and Charleston markets 5¾ cents for U. S. Motor below 65 octane, one-quarter cent under the previous posted level, and making a range of 6 to 6½ cents for 65 octane number gasoline at Charleston, where the quotation was previously a flat 6½ cents.

Aside from the change by the New Jersey company, the principal feature of the week's refinery gasoline market was the marked firmness developed on U. S. Motor below 65 octane number. The general "going" price on this grade had been 5½ cents for some weeks, with some material changing hands under that figure, although the posted price held at 5¾ cents throughout. Increasing demand, however, has materially strengthened the market position, and at the close of the week most of the business was going through at the full posted quotation. Demand for the cheaper motor fuel is expected to record steady gains as warmer weather makes its appearance, and present indications are sales of gasoline under 65 octane number will become a dominant factor in the competitive position in the East this year.

While steadily increasing demand for U. S. Motor under 65 octane number developed during the week, the market for the higher antiknock range product was by no means neglected, and refiners reported an appreciable increase in tank car deliveries. There is a general feeling in eastern trade circles that the refinery gasoline market is "set" for an upward move, and distributors have been filling up their storage in anticipation of such a development.

Refinery stocks of gasoline, for the country as a whole, are somewhat larger than had been planned for this season of the year, but there appears to be a general absence of selling pressure, indicating that previously distressed interests have strengthened their position. Buyers who have been seeking cheap cargoes in the Gulf and California markets have encountered unexpected strength on the part of refiners in both sections. Gulf sellers are quoting 4½ cents for U. S. Motor, averaging 60 to 62 octane number, with Motor gasoline of 65 octane number and better held at 5 cents in cargo lots. The California market is currently quoted at 4¼ cents, with no octane number specified, although the Pacific Coast product mostly runs 65 octane number or better.

The advance of 15 cents per barrel in Mid-Continent crude prices was a decidedly bullish development during the week, and will further strengthen the position of the Gulf market.

Tank Wagon Gasoline

A general advance of one-half cent in tank wagon and service station prices developed in Standard Oil of New Jersey territory last week, the increases going into effect on March 23 and affecting the entire territory with the exception of Delaware. In Philadelphia, Atlantic Refining initiated the advance with an increase of 1 cent, this action being followed by New Jersey Standard, Sun Oil and other large marketers.

Standard Oil Co. of New York and other leading marketers made this advance effective March 25 throughout New York and New England.

Gallonage showed substantial increases during the week. Many firms were closed on Good Friday and a number made it a triple week-end holiday for their employes, some of the large oil companies participating in the holiday shutdown.

Sale of U. S. Motor below 65 octane number is being stressed by many marketers who are using the lower grade product as a "leader" at their filling stations, and it is believed large quantities will be marketed in the East Coast area during the summer. Although the major refiner in this area has established a quarter-cent differential between gasoline of 65 octane number and motor fuel testing under this knock rating, there is a broader spread in the retail markets, generally of 1 cent. The entire question of the effect of octane number upon pricing is now coming in for close attention by refiners and marketers.

Kerosene

Cold weather made for continued heavy movement of kerosene at the refineries last week, and tank car deliveries were running at high levels. Although some burning oil could still be bought at 5¼ cents in the local market, leading sellers were showing more of a tendency to hold for the full posted price of 5½ cents for 41-43 water white in tank car lots, and there were some indications of an early price increase. The inside figure is being generally quoted on shipments into competitive territory, where sales competition from the Pennsylvania refiners is encountered by seaboard refineries.

Tank wagon volume on kerosene continued heavy throughout the week, and posted prices were strongly held in all parts of the territory.

Lubs

Domestic demand for cylinder stocks showed further gains and the market was in strong position, with quotations firmly held at the refineries and on the spot position. Blenders and compounders were coming into the market for lub stock for spring operations in substantial quantities, and export inquiry had also picked up a little.

Industrial lubs were also showing more activity, for the first time in several months, and refiners reported contract withdrawals were on the increase. Quotations for these oils showed a steady tone.

A general break in the retail lub oil price structure is now in process, and the average net returns to marketers this summer will be much smaller per gallon than in past years. Many new retail sources have taken up the distribution of lubricating oils, and offerings of "100 per cent pure Pennsylvania" lubricating oil in 2-gallon cans at $1 for the 2 gallons are by no means uncommon. A few years ago motorists were used to the idea of paying $1 to $1.35 per gallon for Pennsylvania oil, and although none of the leading brands have come down to competitive levels, the volume on branded lubs of the smaller independent refiners and on the private brands of distributors is steadily increasing, with a consequent loss in gallonage to the manufacturers of the better known and advertised motor lubs.

Fuel Oil

Leading refiners and marketers advanced bunker "C" quotations 5 cents per barrel on March 24, Standard Oil Co. of New Jersey initiating the advance by posting 65 cents per barrel at Boston, New York, Baltimore, Norfolk and Charleston, on the Atlantic, and 50 cents at New Orleans and Baton Rouge. Other marketers on the Atlantic Seaboard met the advance at the ports mentioned and other principal markets.

Volume has shown improvement and sentiment in market circles continued bullish, benig stimulated by the 15 cents increase in Mid-Continent crude quotations, which is taken to mark a definite upward turn in the industry's position.

With both California and Gulf fuel oil prices at levels which are too high to make cargo shipments to East Coast ports attractive, it appears the last barriers to a definite recovery in the bunker "C" refinery market in this area are being removed. There is a growing feeling in local market circles that further increases in fuel oil prices will be witnessed in the near future. East Coast refiners have been steadily cutting down their fuel oil surplus during recent weeks and production schedules for the near future indicate continued curtailed output of bunker oil.

Activities in shipping circles are picking up slowly, and with more vessels returning to service, bunkering gallonage is increasing steadily.

Diesel Oil

Gallonage has shown some improvement, refiners report, and the increase in bunker "C" oil prices has strengthened market sentiment, although refiners continue to quote Diesel oil at $1.30 per barrel, in bulk, f.o.b. refinery terminals in the New York harbor district. Marine buyers have increased their contract withdrawals somewhat in recent weeks, and in addition spot demand on the part of the marine trade has likewise shown some expansion.

More inquiry for Diesel oil for delivery to domestic industrial consumers is reaching East Coast refiners, and it is believed this field will witness a steady expansion with the return of normal industrial conditions in various lines. Effective March 23, Standard Oil Co. of New Jersey advanced its quotation for distillate for delivery to shore plants one-half cent to 4 cents, in tank car lots.

Gas Oil

Refiners report a brighter outlook in the gas oil market, but improvement has not yet reached the point where a favorable reaction on prices has made its appearance. The posted price for 28 plus recycled oil holds at 4 cents in tank car lots at refineries, but the "going" price is 3½ cents, and even this quotation is shaded on occasional transactions.

Gas manufacturing companies are taking stocks on contract in large volume, but this outlet will be stemmed somewhat when daylight saving time resumes in most large eastern centers at the close of April.

Furnace Oil

Weather conditions during the greater part of the week were anything but springlike, and furnace oil movement continued active, with quotations one-half cent higher. Refiners are now posting 4 cents for 32-36 gravity oil and 5 cents for 36-40 oil, in tank car lots at refineries, and jobbing demand has been well maintained at the higher levels.

Tank wagon movement of furnace oil has also been heavy, and posted quotations are firmly held. Marketers continue to defer the naming of contract prices for the 1932-33 heating season pending the definite settlement of the oil tariff question. The general feeling is that an import duty will be deflected in higher furnace oil prices. Furnace oil marketers have been circularizing their customers, asking them to write their senators and congressmen in protest of an import tariff on oil, and considerable pressure has been brought to bear against the tariff in this manner. Furnace oil marketers and burner manufacturers fear that higher furnace oil prices will react against sales of new burner installations, and thus cut down the steadily mounting consumption totals of furnace oils.

Wax and Petrolatum

Domestic demand for fully refined grades livened up somewhat during the week, and the higher melting points were in demand. Spot 135-137 a.m.p. was showing a firmer undertone at 4¼ cents per pound, while 133-135 a.m.p. was steady and in demand at 4⅛ cents, although buyers in some instances were refusing to go over 4 cents per pound for prompt shipment material. The lower melting points and crude scale were showing quiet. Export inquiry for both spot and nearby positions continued quiet.

Pharmaceutical and cosmetic manufacturers were in the market for petrolatum in better volume, and shipments were on the increase. Quotations were steady and unchanged on all grades. The lower grades were also coming in for better buying, and prices were showing a somewhat firmer tendency. Export demand continued rather limited on all grades.

Export Market

No cargo fixtures of either gasoline or kerosene were reported in the Gulf export market, although at the close of the week operators were figuring on a cargo of approximately 7,500 tons for May ship-

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Tank Car Prices Advanced in Chicago

Action Is Attributed Chiefly to Announcement by Major Purchasers of a 15-Cent Rise in Price of Crude April 1

By Robert C. Conine

Chicago Bureau, The Oil and Gas Journal, 6 North Michigan Ave.

CHICAGO, Mar. 28.—The gasoline tank car markets Monday had advanced a quarter of a cent over price quotations of the preceding week in the Chicago district, and, although the betterment came in response partly to the continued firm attitude of the refiners in the face of adverse consumer demand, the principal constructive factor is the 15-cent crude oil advance announced for April 1 by several of the major purchasers. Today American Mineral Spirits Co., one of the largest sellers of special naphthas in the territory, announced an advance of a quarter of a cent on all of the naphthas with the exception of lacquer diluents. It is understood that this advance has been met by the other marketers.

The increase in price on the special naphthas is a reflection on the improved gasoline markets. This is the second advance, the first being an eighth of a cent, in two weeks. The price on lacquer diluents is based on the benzol and toluol markets and shows no further improvement this week. In the gasoline tank car markets the quarter of a cent advance which followed the announcement of higher crude oil prices was initiated among the major companies by Empire Oil & Refining Co.

Heating oils, which have been the recipients of a reprieve from the weatherman, are considered firm and slightly better prices are heard, especially in the zero materials. Kerosene is statistically in a better position than any of the other products, including gasoline, and Monday saw the two grades quoted in the territory up an eighth of a cent. Further advances are expected this week, although the condition of the soil makes the possibility of an immediate farm demand remote.

The possibility that low octane gasoline markets will make inroads on the kerosene markets, according to one major refiner in the district, is not a disturbing consideration. The supply of kerosene, prime white and light straw distillate, which figure as the principal farm engine fuels, according to this refiner, is limited and any movement toward gasoline among the farmers will aid the latter market without appreciable reaction on the heavierier motor fuels.

Retail Advance, Pro and Con

It is pointed out that following the last crude oil price advance, November 2 of last year, the service station and tank wagon postings on gasoline were boosted 1 cent throughout the territory. For this reason some of the marketers in Chicago district are looking for another 1-cent advance April 1, when the recently announced crude oil price advances in the Mid-Continent become effective. However, a contrary argument is advanced in important quarters. This is to the effect that the present service station and tank wagon prices are based on a minimum tank car market on the ordinary U. S. Motor grade gasoline of 4¼ cents in effect at the time of the retail advance. It is likewise pointed out that cut-price competition at the service station continues to harass the major sellers throughout the territory and that these marketers are not likely to be disposed toward increasing the advantage of price cutters. This last consideration is taken by some to indicate that the third grade gasoline is not the effective stabilizer of the regular grade gasoline it promised to be, although practically all of the service station reductions which have been made in the territory recently have been on the cut price competition material.

One of the largest operators in the territory said that outside of inertia there isn't the slightest reason why the low of no octane specification gasoline should not be 5 cents, and the service station postings at least 1 cent higher on the regular grade. This refiner would not venture to predict a 5-cent market for this summer, but he expressed the belief that before another week had passed the low will be 4 or 4¼ cents, depending upon the weather and the attitude of the refiners.

Reaching Sellers Market

There are various little indications that the slackness in jobber buying is not altogether a device on the part of the jobbers to beat down the markets. For one thing, sellers have become extremely cautious in the matter of credit and there are numerous instances where a jobber would store gasoline if he could pay for it and lacking the necessary funds this jobber's business is a hand-to-mouth proposition, expanding and contracting with the turns of the weather. And the weather for the past two weeks has been miserable from the standpoint of gasoline consumption. The considerably increased strength in the crude oil markets has done much to eliminate the threat from irresponsible refiners who have in the past flooded advancing gasoline markets. The situation as viewed in Chicago district oil trade circles is this, a number of refiners are blamed for most of the past ills of the gasoline markets, and these refiners may expect no co-operation whatever. Other refiners (those who have sold their "distress" gasoline to the larger refiners without using the funds thus secured to run larger quantities of crude to their stills) will find buyers when the necessity to liquidate stocks arises. Higher crude prices will prevent the irresponsibles from flooding the markets in the manner of last year.

Other Territories Advance

While the prospects for an advance in the service station and tank wagon markets in the 11-state territory of Standard Oil Co. (Indiana) are not particularly bright, higher postings were introduced last week, ranging from half a cent to 1 cent, in the territories in which Standard Oil Co. of New Jersey, Atlantic Refining Co. and Standard Oil Co. of New York operate. In the Louisville area, Standard Oil Co. of Kentucky advanced the retail postings 1.5 cents last week to restore the service station and tank wagon markets there to normal. Milwaukee is rivaling Detroit as a hotbed of price cutting, the latest development being the cutting of the third grade price to 7.5 cents, exclusive of the state 4-cent tax, by Standard of Indiana.

In Milwaukee the two principal trackage station operators are Direct Service Co. and Daily Refining Co., each with three stations. The first is understood to have a connection with a district refiner from whom it obtains the gasoline laid down at its stations for 6.5 cents. The second is selling a good blended gasoline in the middle octane range. Developments in the natural gasoline and blending naphtha markets are serving to close up the gap between the cost of the blended motor fuel and the price of U. S. Motor gasoline.

One marketer in Chicago last week had the following experience. On Friday he turned down an offer of five cars of stabilized natural gasoline at 1⅞ cents. Saturday morning the price had gone up to 2 cents and at noon of the same day he received a wire that the price had jumped to 2¼ cents. The 50-52, 450 endpoint blending naphtha has moved up from a range of 3¼ cents and 3½ cents to a range of 3⅜ cents and 3¾ cents, with little of the material available at the low figure. The Blue Island (Chicago) refinery which has been delivering gasoline in Milwaukee at 5 cents is expected to advance its price a quarter of a cent this week. The gasoline is considerably below 40 octane number. A new wrinkle which smacks of trackage station tactics is reported concerning one of the major companies. This is a form of customer contract wherein the customer agrees to buy all of his gasoline from a certain station and receives in return a discount of 25 per cent on greasing and cleaning jobs.

Chicago Regular Grade Gasolines

Octane rating and distillation tests made Saturday on the regular grade gasolines of Sinclair, Shell, Texas, Standard and Phillips companies showed the following results:

	"A"	"B"	"C"	"D"	"E"
Gravity	62.9	60.3	61.4	67.2	62.3
Color	27+	27+	30+	26+	22+
Doctor	neg.	neg.	neg.	neg.	neg.
Cor. @ 122° F.	neg.	neg.	neg.	neg.	neg.
Octane number	66.8	62.6	63.5	61.6	65.6
Initial	83	87	87	80	83
10 per cent	128	144	140	118	128
20 per cent	160	180	173	136	159
30 per cent	189	212	203	156	190
40 per cent	217	241	230	180	223
50 per cent	241	266	253	210	251
60 per cent	264	288	275	244	278
70 per cent	290	314	300	280	300
80 per cent	317	341	326	320	328
90 per cent	349	372	356	368	257
95 per cent	374	397	382	401	383
Endpoint	386	400	392	416	395
Recovery	96.5	96.0	96.5	96.5	97.0
Residue	1.1	1.1	1.1	1.7	1.1
Loss	2.4	2.9	2.4	1.8	1.9
Per cent over:					
145° F.	16.0	10.5	11.5	26.0	16.0
212° F.	38.0	30.0	33.0	51.0	36.0
221° F.	41.5	33.0	37.0	54.0	39.5
284° F.	69.0	58.5	63.5	71.5	64.0
392° F.	...	94.5	96.0	93.5	96.0

Although the 20,000-bbl. combination skimming and cracking unit with which Standard of Indiana plans to produce a 70-octane gasoline has not been completed, the gasoline of this company has advanced three points in octane rating since tests were run a month ago. Another of the companies whose gasoline is listed in the foregoing has advanced the antiknock rating five and a half octane numbers since a month ago. A sixth major refiner whose volume of retail business in the area is in Milwaukee is selling a regular grade of 67.9 octane number.

Standard Oil Co. (Indiana) on March 22 adjusted prices at three principal points in Indiana to meet freight rate changes. At Evansville the tank wagon price was advanced 0.1 cent to 16.3 cents, while the service station price remained at 15.6 cents. At Indianapolis both postings were cut 0.1 cent. At South Bend the postings were advanced 0.3 cent. Kerosene tank wagon prices were changed as follows: Evansville, advanced 0.1 cent to 10.8 cents; Indianapolis, reduced 0.1 cent to 10.1 cents; South Bend, remained at 8.1 cents due to competitive conditions. At Grand Rapids the kerosene tank wagon price was reduced 0.2 cent to 10.5 cents. On March 16 the service station price on gasoline was cut 1.1 cent at Quincy.

Gasoline Tank Car Markets

It will take at least a week of warm weather to put the roads into shape for heavy traffic. Snow and cold have retarded consumer demand and prevented, it is believed here, a buying activity which would have assured a minimum price of 4 cents on the no octane specification gasoline. A slight increase in jobber buying has been noted, but this business is still far from satisfactory. Refiners, it is reported, continue to hold off selling except at their price, which is usually a quarter of a cent above the price the marketer feels inclined to pay at this time. Few refiners are selling ahead for more than a week and there is every indication that whether or not they are moving any material the refiners are in control and are showing no signs of relinquishing their hold. Here and there a refiner is reported to be offering from 5 to 25 cars of U. S. Motor gasoline at prices below the ruling markets, but so far closer examination has found these claims to be baseless.

It was found Saturday that one of the refiners reported to be the chief contributor to an alleged soft spot in the gasoline markets has withdrawn from the markets entirely, moving his quotations out of range by a quarter of a cent. If there are any oversize flies in the ointment right now, the responsibility lies with certain of the larger refiners who have given contracts providing as much as half a cent below the low of the going market. The various contracts available in the territory constitute the principal source of grief in the marketing end of the business.

April is normally a wet month and nothing spectacular is expected from the consumption angle, although the improvement will probably justify the stand which has been taken by refiners throughout the Mid-Continent. The bad weather appears to be nearly over and most of the marketers are confidently looking forward to a bulge in jobber buying this week. One drawback is the fact that March 31 is the day upon which the personal property tax assessors make their rounds and it is reasonable to suppose that properties will not be enhanced in value to any considerable extent before the first of the month.

Monday the gasoline tank car markets showed an advance of a quarter of a cent from last week's quotations except in the 68-70, 360 endpoint material which moved up an eighth of a cent to a range of 4⅜ cents to 4⅝ cents. The U. S. Motor grade gasoline was quoted at 3¾ cents to 4 cents. The 60-62, 400 endpoint gasoline is offered at 3⅞ to 4⅛ cents, and the 64-66, 375 endpoint gasoline is quoted at 4¼ cents to 4½ cents. Fighting grade aviation gasoline is priced nominally at 5½ cents.

Naphtha Tank Car Markets

The special naphtha tank car markets have provided one of the brightest spots in the refined products markets. Last week the entire list was advanced an eighth of a cent, and a further increase of a quarter of a cent was registered. While the improved gasoline markets are

mainly responsible for the betterment, an important factor is the fact that most of the friction among the major sellers has been eliminated after many months of selling at a loss. The prices Monday were: Cleaners' naphtha, 6 cents to 6¼ cents; lacquer diluent, 180-250°, 9⅛ cents to 9⅜ cents; lacquer diluent, 140-200°, 9⅛ cents to 9⅜ cents; rubber solvent, 100-300°, 6⅛ cents to 6⅝ cents; Stoddard solvent, 300-410°, 5¼ cents to 5½ cents; petroleum thinner, 290, 300-415°, 4¾ cents to 5 cents; V.M.&P. naphtha, 190, 200-330°, 5⅝ cents to 5⅞ cents; petroleum spirits, 340-410° (46-47 gravity), 4¼ cents to 4⅝ cents.

Kerosene Tank Car Markets

The kerosene tank car markets, according to observers in Chicago district, are the most certain to gain strength at this time among the refined products. As mentioned above, stocks of suitable material are comparatively scarce at the threshold of expanded consumer demand. Monday's prices showed an advance of an eighth of a cent over last week's quotations and the majority of sellers feel sure that an advance of at least an eighth of a cent will be recorded this week. The 41-43 water white material is offered in small quantities at 2¾ cents to 3 cents, and the 42-44 water white kerosene is moving at 3 cents to 3⅛ cents. Prime white distillate is scarce at 2⅛ cents. There is actually no particular demand for kerosene now, an occasional flurry of business and then quiet, is the experience since export business waned. One little spurt of buying recently had an unusual cause. On the south side of Chicago there were so many residents who could not pay their electric light bills that when they were cut off by the utility the wholesale switch to kerosene lamps brought a nice bulge in the tank wagon business. It is reported that many of the farm engines and tractors are now adapted for the use of heavier distillates and this may have some effect adversely on the expected farm demand this spring.

Gas Oils and Fuel Oils

The season for heating oils has been extended by near zero weather. The main consuming period for these materials has been severely curtailed by a mild winter so that the statistical position is probably on the bad side. However, distributors have been able to keep their prices up fairly well in the face of adverse conditions. The tank wagon postings on the No. 1 oil and the No. 2 oil were lowered half a cent when spring made a false entry some weeks ago, but since that time the conditions which led to the reduction have changed for the better. One of the bearish factors was the unloading of 38-40 straw distillate by a major refiner. This material in the light straw has advanced an eighth of a cent to 2⅛ cents and 2¼ cents; the 38-40 straw range narrowed upward an eighth to 1⅞ cents and 2 cents; the 32-36 straw has a new range of 1¾ to 1⅞ cents. The 32-36 industrial gas oil and the fuel oils remained steady in price with the movement sluggish.

JERSEY COMPANY ADOPTS OCTANE BASIS

(Continued from Page 131)

ment to France. The inquiry was for a mixed cargo of Navy and prime white kerosene, with option of Navy, prime white, and 64-66 gasoline. Rumania was reported quoting on the same cargo.

While gasoline prices quoted in the Gulf market remained unchanged, quotations were largely nominal and there were reports of impending fractional advances, the market strength being based both on the firmer gasoline markets at refineries in the Group 3 and Gulf Coast areas, and the increase in crude oil quotations.

Kerosene was firmer at the Gulf, with prime white for export quoted at 4⅜ cents and water white at 4⅝ cents.

There were no cargo sales of Venezuelan or Mexican crude reported in the open market, and prices were unchanged at the previous week's levels on both grades.

With the exception of paraffin wax, movement of which continued heavy, export shipments of refined products registered substantial declines locally during the week ended March 19. Inquiries continued fairly numerous, but the amount of new business fell below expectations.

The following table shows refined petroleum exports from the port of New York for the past three weeks (all figures in gallons unless otherwise noted):

	Week ended		
	Mar. 19	Mar. 12	Mar. 5
Gasoline	8,000	60,000	25,000
Naphtha	310,000	510,000	8,000
Kerosene	15,000	45,000	70,000
Fuel oil	14,000	2,000	160,000
Lubricating oil	535,000	600,000	620,000
Petroleum, ref'd.	165,000	690,000	80,000
	Pounds		
Petrolatum	485,000	50,000	
Paraffin wax	2,010,000	1,850,000	645,000
Refined			
Scale	135,000	515,000	410,000
Lub. grease	475,000	890,000	675,000

Aviation gasoline has come to the fore as a factor in the export market, and shipments of the cased product, to virtually all parts of the world, are running into fairly large totals. A number of the Standard Oil units, working in collaboration through Stanavo Products, Inc., have developed a world-wide market for aviation gasoline and lubricants made to the advanced specifications of this agency and gallonage is showing slow but steady gains in foreign markets. Considerable quantities are being shipped to South America, where commercial aviation has made remarkable strides during the past several years.

Imports

Imports of crude and refined petroleum at the principal United States ports for the week ended March 19 totaled 1,621,000 bbls., a daily average of 231,571 bbls., compared with 2,152,000 bbls., a daily average of 307,429 bbls. for the previous week, and a daily average of 269,286 bbls. for the four weeks ended March 19. Details follow:

	Bbls. of 42 gals.
At Atlantic Coast Ports—	
Baltimore	232,000
Boston	63,000
New York	591,000
Philadelphia	180,000
Others	240,000
Total	1,306,000
Daily average	186,571
At Gulf Coast Ports—	
Galveston district	59,000
New Orleans and Baton Rouge	209,000
Tampa	47,000
Total	315,000
Daily average	45,000
At all United States Ports—	
Total	1,621,000
Daily average	231,571
Daily average four weeks	269,286

Distribution of total imports is as follows:

Crude	712,000
Gasoline	481,000
Fuel oil	428,000

It is expected that import totals during the next several weeks will register sharp advances, as the import movement has been substantially increased in anticipation of possible early imposition of import duties on crude and refined.

California Oil Receipts

Receipts of California crude and refined petroleum at Atlantic ports during the week ended March 19 were confined to one cargo, made up of 67,000 bbls. of gasoline and 8,000 bbls. of lubricants, at New York. The week's total, 75,000 bbls., was an average of 10,714 bbls. per day, and compared with 113,000 bbls., an average of 16,143 bbls. daily, during the previous week, and an average of 9,607 bbls. per day for the four weeks ended March 19.

Several cargoes of California gasoline have been fixed for shipment to Baltimore and Providence during the next few months, and it is expected that intercoastal movement will show some increases as gasoline consumption shows the usual seasonal expansion in the East.

R. L. O'BRIEN DEAD

Robert Leo O'Brien, for nine years manager of the Rig Equipment Co. of Tulsa, died in a Pittsburgh, Pa., hospital on March 16, aged 42 years. Mr. O'Brien was born in Bradford, Pa., but spent much of his early life in Washington, Pa. He was employed by the Petroleum Iron Works in Sharon, Pa., before coming to the Mid-Continent Field. Mrs. O'Brien and four children survive.

KANSAS FIELDS

(Continued from Page 40)

7-26-1e, an old well, topped Siliceous lime at 3,368 feet, total depth 3,374 feet, and is now plugging back to Lansing formation. Wibble Ice & Cold Storage Co.'s No. 1 fee, SE cor. NW SW NW Section 27-27-1e, Eastborough Pool, is dry and abandoned at 1,587 feet. Fisher & Lauck's No. 1 trustee, NE cor. SW SE Section 19-27-2, has been deepened from 2,938 feet to 3,244 feet and made 600 bbls. on the pump.

A report of the potential tests follows:

Company and well—Viola lime—	Potential tests 2-25 to 3-13
Carey No. 1 Holt	1,862
Darby No. 4 Kaegi	1,324
Derby No. 1 Domsch	968
Derby No. 4 Domsch	1,368
Derby No. 8 Domsch	602
Derby No. 1 Sellers	852
Derby No. 1 Unruh	1,372
Dieter-Youker No. 1 Sellers	704
Dieter-Youker No. 2 Sellers	1,366
Gypsy No. 1 Lovett	Est. 1,000
Hays-Hinkle No. 1 Koehn	684
Johnson-United No. 1 McGill	Est. 1,200
Lario No. 1 Becker	1,358
Lario No. 1 Boal	1,522
Lario No. 1 Grattan	1,392
Lario No. 1 Lacquemont	1,412
Lario No. 1 Lagree	1,430
Lario No. 2 Lagree	1,346
Lario No. 1 Law	844
Lario No. 1 Lewis	1,452
Lario No. 1 "B" Miller	1,020
Lario No. 1 L. L. Miller	1,268
Lario No. 2 L. L. Miller	1,296
Lario No. 1 Sellers	810
Lario No. 1 Suffield	1,038
Lario No. 2 Suffield	1,342
Lario No. 3 Suffield	1,430
Lario No. 1 Wiggers	1,400
Lario No. 2 Wiggers	1,306
Lassen No. 1 Hale	1,208
Lassen No. 2 Hale	Est. 1,400
McBride No. 1 Whitright	1,032
McBride No. 2 Whitright	1,684
Mid-Kansas No. 1 Garrett	1,330
Mid-Kansas No. 1 Unruh	1,216
Mid-Kansas No. 2 Unruh	1,274
Mid-Kansas No. 1 Whitright	998
Mohawk No. 1 McGill	M.A. 50
Olson No. 1 Johnson	1,446
Olson No. 2 Johnson	1,234
Olson No. 3 Johnson	698
Olson No. 2 Koehn	658
Olson No. 4 Koehn	M.A. 50
Palmer No. 3 Anna Winn	M.A. 50
Phillips No. 1 Anderson	1,140
Phillips No. 2 Anderson	1,452
Phillips No. 3 Anderson	1,710
Phillips No. 4 Anderson	Est. 1,200
Phillips No. 1 Garrett	740
Phillips No. 3 Garrett	1,346
Phillips No. 1 Grattan	1,118
Phillips No. 2 Grattan	1,408
Phillips No. 1 Hindmarsh	992
Phillips No. 1 Wiles	1,666
Plains No. 1 P. J. Unruh	934
Plains No. 1 "B" P. J. Unruh	1,066
Plains No. 2 "B" P. J. Unruh	996
Reserve No. 1 J. M. Ritz	Est. 600
Reserve No. 2 J. M. Ritz	862
Reserve No. 1 O. A. Ritz	Est. 700
Rosenthal-B'rdmore No. 1 Ritz	1,046
Rosenthal-B'rdmore No. 2 Ritz	1,256
Shell No. 1 Anderson	F.P. 20
Shell No. 1 Lewis	1,184
Stearns-Streeter No. 1 Blair	F.P. 20
Syndicate No. 1 Becker	Est. 1,000
Syndicate No. 2 Becker	1,162
Syndicate No. 3 Becker	1,382
Syndicate No. 4 Becker	1,704
United-Boyle et al No. 1 Smith	1,112
Vernon No. 1 Drum	1,392
Wakefield No. 1 Koehn	1,494
Wolf Creek No. 1 McMurray	1,620
Total 73 Viola wells	81,618
Chat wells—	
Anderson No. 1 Lacquemont	F.P. 30
Barnsdall No. 1 Aelmore	F.P. 10
Braman No. 2 Koehn	F.P. 35
Breslin No. 1 Flook	M.A. 100
Carey No. 1 Smith	F.P. 20
Dickey No. 1 Decker	3,675
Dickey No. 2 Decker	3,194
Dickey No. 1 Williams	M.A. 100
Dickey No. 2 Williams	M.A. 100
General No. 1 Severtson	M.A. 100
Jones No. 1 Flook	1,440
Jones No. 1 Holmes	M.A. 100
Lario No. 1 Miller	M.A. 100
Lario No. 2 Miller	3,088
Lario No. 3 Miller	M.A. 100
Lario No. 4 Miller	M.A. 100
Lario No. 1 Ritz	M.A. 100
Lario No. 1 "A" Ritz	F.P. 50
McBride No. 1 Gustafson	F.P. 20
McPherson No. 1 Lindberg	F.P. 35
McPherson No. 1 Robinson	F.P. 60
McPherson No. 1 Salthouse	F.P. 5
Marileen No. 1 Munn	M.A. 100
Marileen No. 2 Munn	M.A. 100
Mid-Kansas No. 1 Pitts	F.P. 40
Olson No. 1 Koehn	F.P. 40
Olson No. 2 Koehn	F.P. 75
Palmer No. 1 Ritz	M.A. 100
Palmer No. 2 Ritz	M.A. 100
Palmer No. 1 Anna Winn	M.A. 100
Palmer No. 2 Anna Winn	M.A. 100
Palmer No. 1 "B" H. Winn	M.A. 100
Rose-Spring No. 1 Dielmann	1,216
Rush No. 2 Robinson	M.A. 100
Shawver No. 1 Decker	504
Shell No. 2 Giffin	F.P. 70
Shell No. 1 Miller	F.P. 25
Shell No. 3 Ritz	F.P. 25
Stanolind No. 1 Flook	F.P. 40
Stanolind No. 2 Flook	F.P. 40
Stanolind No. 3 Flook	M.A. 100
Stanolind No. 4 Flook	550
Stearns-Streeter No. 1 Chindb'g.	F.P. 35
Texas No. 2 Munn	F.P. 30
Texas No. 3 Munn	M.A. 100
Texas No. 4 Munn	M.A. 100
Texas No. 5 Munn	M.A. 100
Washoma No. 1 Meeks	F.P. 25
W-K-Hagny No. 1 Knudson	M.A. 100
Wolf Creek No. 1 Dunsford	F.P. 50
Wolf Creek No. 1 Krehbiel	F.P. 20
Youker No. 1 Eaton	188
Youker No. 1 Grattan	380
Total 51 chat wells	17,215
Total Ritz-Canton-Decker area, 124 wells	98,833

Est.—estimated. F.P.—full production. M.A.—minimum allowance.

LA.-ARK. FIELDS

(Continued on Page 42)

feet. This is the second test drilled in this immediate vicinity by these operators, the first one had a good show of oil at about the same depth, but salt water intrusion ruined its chances. In the same county a semiwildcat on a 1,000-acre block, H. H. Helms' No. 1 Berry Davis, Section 31-16-14, cored salt water sand at 2,762 feet.

Daily Average Runs

There was an increase of 635 bbls. in the daily average runs from the fields of North Louisiana and Arkansas during the past week. The Zwolle Field of North Louisiana came back to about its normal yield to make up for the decline of last week. The daily average runs from the several pools were:

NORTH LOUISIANA	
Caddo light	5,330
Caddo heavy	2,050
Cotton Valley	580
DeSoto and Red River	2,030
Elm Grove	335
Haynesville	4,655
Holly	295
Homer	2,870
Pleasant Hill	315
Sarepta-Carterville	815
Urania	3,020
Zwolle	5,620
Total North Louisiana	27,905
Total previous week	27,280
Increase	625

ARKANSAS	
Champagnolle	1,890
El Dorado	3,090
Lisbon	560
Nevada	1,240
Smackover light	2,830
Smackover heavy	23,065
Stephens	660
Urbana	760
Total Arkansas	34,145
Total previous week	34,135
Increase	10
Total both states	62,050
Total previous week	61,415
Increase	635

AGREEMENT REACHED ON TURNER VALLEY PLAN

CHATHAM, Ontario, Mar. 26.—Announcement has been made by Dr. R. C. Wallace, chairman of a conference of Alberta government and oil company representatives, that a basis of agreement for conservation of gas resources of the Turner Valley Field has been reached.

Until a formal report is prepared and presented to Premier J. E. Brownlee, no details of the agreement will be given out. It was stated, however, that the conference had reached a basis of agreement with regard to the policy to be followed in conservation of gas, the procedure to be followed in dealing with the management of the field, and the matter of compensation to operators. Minor points of difference were also settled. The form the administrative body in charge of the field would take was one of the chief points of contention during the conference.

REPORTED WELL IN BRAZIL

An oil well with a reported capacity of 15,000 bbls. daily has been brought in a few miles from Maceio, Brazil, the capital of the State of Alagaos, according to a Mexican technician, Dr. Felipe Benito Romero, wno said huge oil deposits may exist in the area.

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Brief Items for Petroleum Refiners

Refinery Technology Committee of 20 for Ensuing Year Named

A committee of 20, exclusive of chairman and secretary, representing refining branches of the industry in all parts of the country, has been named to constitute the committee on refinery technology for the American Petroleum Institute for 1932. The appointments were made by D. J. Moran of Ponca City, Okla., vice president and chairman of the Division of Refining of the institute. Walter Miller, Continental Oil Co., Ponca City, is chairman of the committee on refinery technology, and Dr. R. P. Anderson, American Petroleum Institute, New York, is secretary. Others named to the committee are:

D. G. Brandt, Henry L. Doherty & Co., New York; H. W. Camp, Empire Oil & Refining Co., Tulsa; S. P. Coleman, Humble Oil & Refining Co., Houston; T. G. Delbridge, Atlantic Refining Co., Philadelphia; R. A. Halloran, Standard Oil Co. of California, San Francisco; R. E. Haylett, Union Oil Co. of California, Los Angeles; F. E. Holsten, Barnsdall Refining Co., Tulsa; E. R. Lederer, Texas Pacific Coal & Oil Co., Fort Worth; N. E. Loomis, Standard Oil Co. of New Jersey, Elizabeth, N. J.; K. G. Mackenzie, The Texas Company, New York; John W. Newton, Magnolia Petroleum Co., Beaumont; R. C. Osterstrom, The Pure Oil Co., Chicago; L. W. Parsons, Tide Water Oil Co., Bayonne, N. J.; A. E. Pew, Jr., Sun Oil Co., Philadelphia; D. Pyzel, Shell Oil Co., San Francisco; J. B. Rather, Standard Oil Co. of New York, Brooklyn; H. G. Smith, Gulf Refining Co., Philadelphia; F. W. L. Tydeman, Shell Petroleum Corp., St. Louis; L. B. Van Leuven, Vacuum Oil Co., New York, and R. E. Wilson, Standard Oil Co. (Indiana), Chicago.

OIL FOUND TO BE MORE ECONOMICAL THAN COAL

NEW YORK, Mar. 28.—With heavy oils selling at the lowest levels in the recorded history of the industry there has been a quiet, but substantial, trend toward the conversion of coal burning equipment to oil-firing in numerous lines of industry during the past several months, and domestic sales of heavy oils, in consequence, have been steadily widening.

Refiners have been able to quote low prices on heavy oil for industrial use, and to quote consumers "top" prices on long term contracts. In many instances, it is reported, the savings in the adoption of oil in preference to coal have been so substantial that consumers have been able to effect economies sufficient to cover the cost of the changeover in six to nine months. Contracts covering these deliveries have been made for two and three-year periods, so the fuel savings to large industrial users have been heavy.

The development of the industrial market has resulted in a considerable increase in tank car movement of heavy oils from the refineries and has tended in large measure to offset the gallonage drops resulting from curtailed takings of bunker oil by the marine trade.

DALE RESUMES OPERATIONS

ELECTRA, Tex., Mar. 26.—The Dale Oil & Refining Co. will resume operations in its 6,000-bbl. plant located here within the next few days. The plant will run approximately 2,000 bbls. of crude daily. Offices of the company will be moved to Electra.

VALUE OF OIL IMPORTS SHOWS SHARP DECREASE

By C. E. Kern
Washington Bureau, The Oil and Gas Journal

WASHINGTON, D. C., Mar. 28.—The value of all imports of petroleum and products decreased from $8,809,225 in February, 1931, to $7,570,471 in the same month of this year, according to the monthly summary of the Bureau of Foreign and Domestic Commerce.

Of these total imports crude oil imported amounted to 4,788,717 bbls. valued at $4,781,543 for February, 1931, decreasing to 4,707,544 bbls. valued at only $3,472,579 in February, 1932.

Venezuela was the source of crude to the extent of 2,047,200 bbls. valued at $1,854,681 in February, 1931, slightly decreasing to 2,035,924 bbls. valued at only $1,015,502 in February of 1932.

Imports from Colombia decreased from 1,711,000 bbls. in February, 1931, to 1,670,000 bbls. in the same month of this year. Mexican imports into the United States increased from 521,500 bbls. in February, 1931, to 647,242 bbls. in February of this year.

The imports from the Netherland West Indies decreased from 339,287 bbls. in February, 1931, to 289,994 bbls. in February, 1932.

Imports of topped crudes including fuel oil increased from 1,956,029 bbls. in February, 1931, to 2,305,273 bbls. in February, 1932, of which 2,179,060 bbls. came from the Netherland West Indies.

Imported gasoline, naphtha and other finished light products increased from 947,988 bbls. in February, 1931, to 1,202,512 bbls. in the same month of this year. Nearly all of this gasoline, or 1,041,465 bbls., was from the Netherland West Indies.

Imports of paraffin and paraffin wax greatly increased from 3,034,481 pounds in February, 1931, to 8,293,731 pounds in the same month of this year.

ARUBA EMPLOYES PROTEST

NEW YORK, Mar. 26.—D. I. Maxwell, president of the Pan American Employes Association at Aruba, D.W.I., has cabled acting Chairman Charles R. Crisp of the Ways and Means Committee of the House at Washington, protesting against the proposed import tax on petroleum products into the United States.

"On behalf of more than 1,200 American citizens residing in Aruba," Mr. Maxwell said, "who are dependent upon their employment in the American refinery here, most of the petroleum products of which are imported into the United States, I most earnestly urge reconsideration by your committee of the proposed prohibitive tax on such importation, the consequence of which is a matter of deepest anxiety and concern to those for whom I speak and whose welfare may be vitally and most adversely affected thereby."

GOVERNMENT CONTRACTS

NEW YORK, Mar. 26.—The following awards of government contracts for petroleum products have been announced:

Deep Rock Oil Corp., Chicago, 28,000 gallons of gasoline for Fitzsimmons General Hospital, 7.2 cents per gallon; 28,000 gallons of gasoline for Fort Logan, 7.2 cents per gallon; 140,000 gallons of gasoline for Fort Sill, 5.25 cents per gallon.

Standard Oil Co., of Indiana, Chicago, 14,000 gallons of gasoline for Fort Francis E. Warren, 7.49 cents per gallon.

Hydro-Carbon Products Co., New York, 167,591 pounds of benzene at 2.57 cents per pound, delivery at Picatinny Arsenal, N. J.

CONOCO REFINERY HEADS ATTEND ANNUAL MEETING

Refinery superintendents of the Continental Oil Co. held their third annual meeting at the Conoco Club in Ponca City, Okla., March 21 to 26. P. A. Axe, of the Texas City, Tex., terminal, and Fred Nesmith, of the Riverside, Tex., clay plant, attended, along with various officials of the company and Ponca City refinery men. Those present gave intensive study to refinery problems and the operation of various refineries. Technical questions were discussed by experts. Walter Miller, vice president of the company, in charge of manufacturing, presided.

Wesley I. Nunn spoke on "Advertising." Ponca City men on the program included Fred G. Fellows, superintendent of the Ponca City refinery; R. D. Johnson, W. M. Haynes, K. W. Shimeall, Alf Herickson, chief chemist; M. E. Clawson, Robert Best, Paul Zurcher, H. G. Osborn, Harry J. Kennedy, general sales manager; Charles D. Hull, L. L. Davis, J. O. Thoen, M. L. Cobb, Bert Lincoln, Baird H. Markham, Joe S. Boylan and Frank Rees.

Out-of-town guests included J. D. Yoder of the Cochrane Corp., Philadelphia; A. S. Johnson, Jr., of the M. W. Kellogg Co., New York; F. J. Bartholomew of the Chemical Construction Co., Charlotte, N. C.; Harry P. Byers of the Babcock and Wilcox Co., Denver; Dr. Gustav Egloff of the Universal Oil Products Co., Chicago; Dr. M. R. Mandlebaum of the Gray Processes Corp., New York; K. P. Murley of the Ingersoll-Rand Co., Tulsa; D. A. Leach of the Chicago Bridge & Iron Works Co., Tulsa; H. R. Swanson of the Alco Products Co., New York; L. E. Adams, president of the Anchor Packing Co., New York; Norman W. Sterling of the M. W. Kellogg Co., New York; A. M. Hovlid, superintendent of the Glenrock, Wyo., refinery; C. R. Tillman, superintendent of the Florence, Colo., refinery, and J. W. Brown, superintendent of the Baltimore refinery.

WILL DISCONTINUE OIL PURCHASES ON APRIL 1

CASPER, Wyo., Mar. 28.—The White Eagle Oil Corp. and the Midwest Refining Co. have notified producing companies in the Dallas, Derby Dome and Hudson districts, from which they have been buying crude oil for the last year, that when the contracts expire on April 1 they will discontinue purchases until further notice. White Eagle has been buying approximately 15,000 bbls. per month, and the Midwest approximately 1,450 bbls. The purchasing companies say they have little room left for storage.

NEW CALIFORNIA REFINERY

BAKERSFIELD, Calif., Mar. 28.—The Mohawk Petroleum Co. will build a 1,500-bbl. refinery near Fruitvale, the contracts having been closed during the past week. Topping equipment will be erected to run the local crude to heavy road oil bottoms and along with this product gasoline, kerosene and fuel oil will be manufactured. The plant is expected to be in operation by June 1.

SET RECORD AT PHILADELPHIA

NEW YORK, Mar. 28.—Eleven tank vessels arrived on Monday of last week at the port of Philadelphia, with a total of 905,000 bbls. of crude oil from Texas to refineries, says the Daily Freight Record. This is the largest amount of crude received in a single day at the port of Philadelphia for at least six months, the Freight Record continues.

TIDE WATER TO APPEAL EDELEANU IMPORT CASE

NEW YORK, Mar. 26.—The Court of Customs and Patent Appeals has ruled that the value of machinery for import duty purposes is increased by any provision in the sales contract giving the seller the right to use without royalties improvements the purchaser make, the decision being in the case of the United States versus Tide Water Oil Co.

Tide Water last year imported lub oil equipment manufactured in Germany, to utilize the Edeleanu process, the contract price for the equipment being $192,700, but the agreement providing that Tide Water was to pay annual royalty of $20,000 for the first five years of the operation of the still. In as much as there was no foreign value on the plant, duty was assessed on the basis of the export value, using the sales price, plus the $100,000 royalty.

The Court of Customs and Patent Appeals held that the $100,000 in royalties was not part of the payment for the plant, in as much as title passed to Tide Water when the machinery left Germany and that the additional royalty payment would not be due if the plant were not operated. However, the court ruled, the sales price could not be taken as the real export value because of a provision in the contract giving the Edeleanu organization the right to use without royalty any improvements in refining process that Tide Water Oil Co. might devise.

This latter provision, the court held, was a material consideration, and that the contract price, therefore, was not a proper export value.

INDIANA STANDARD GETS POST OFFICE CONTRACT

CHICAGO, Mar. 28.—The Standard Oil Co. of Indiana was awarded the contract for 250,000 gallons of gasoline as the second quarter requirements of the local post office department. Award was made on basis of Chicago bulk plant delivery price one-eighth cent below the average tank car market price f.o.b. Group 3 Oklahoma on date of delivery plus handling charge. The maximum price to be paid will not exceed 6.12162 cents a gallon. State tax is not included. Discount of 1 per cent 10 days will be allowed. Grade of gasoline will be 57 to 64 octane. This is the first time the postoffice business has been placed on a bulk basis, most previous contracts having been taken on a tank car market basis.

REFINERIES FOR OSAGE FIELD

CASPER, Wyo., Mar. 28.—Additional refining facilities for the Osage Field continue the subject of plans. The Egaso Operating Co. is negotiating with the Schwartz interests concerning the leasing of the Egaso plant, formerly operated by the United States Refining Co. The Schwartz interests control the Arro Oil & Refining Co., Lewistown, Mont., and have been purchasing large quantities of Osage crude for two years. The Egaso plant has a reported capacity of 1,000 bbls. a day. The Slack Petroleum Co. of Tulsa is another refinery prospect.

ASK USE OF NAVY TANKERS

SANTIAGO, Chile, Mar. 26.—The Valparios Automobile Association and local business firms are petitioning the federal government to utilize the navy tankers to bring petroleum products into the country from California to escape the 25 per cent advance in the price on these commodities planned to be made effective in the near future.

View in the testing department where every Jenkins standard bronze valve is given a wide-margin test both on steam and water.

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Every Jenkins Standard Bronze Globe, Angle, Cross and Check Valve is tested before it is shipped from the factory. It is made to demonstrate by a wide margin that it is tight and stays tight under the pressure for which it is rated. This test is carried out not only with water pressure but also with steam.

The testing plant in the Jenkins Factory is staffed with competent men whose responsibility is to see that all Jenkins Valves pass the Jenkins wide-margin test. Obtainable at your supply house. In writing us direct, ask for Form 141.

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BRONZE IRON STEEL
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JENKINS VALVES ARE ALWAYS MARKED WITH THE "DIAMOND"

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Have our nearby Service Man give you the details of the Oakite method developed for this work. A post card request brings him to your plant. No obligation. Write today.

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Oakite Service Men are located in the principal producing and refining centers of the U. S. and Canada.

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Industrial Cleaning Materials and Methods

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This organization is prepared to furnish information, data, maps, etc. on geology, leasing and drilling in Washington, Oregon, Idaho and British Columbia.

All Inquiries Confidential

COMPETITION MAKES AN OPEN MARKET

(Continued from Page 34)

ence which they could exert and which is so urgently needed. A disorganized market is hurtful to the industry and eventually detrimental to the consuming public."

Mr. Winship asserts that an unsound price structure during recent years has been the chief direct cause of excessive duplication of gasoline marketing facilities.

"Analysis of conditions in every town of the United States having a population of 1,000 or more," he said, "and in many smaller villages convinced me that at least 111,594 service stations are unnecessary. There are 6,351 cities and towns in the United States in which service stations are warranted. In other localities, car owners can be quite adequately and much more economically served by their local garages. Of the 6,351 towns, no less than 5,519 are oversupplied with stations. Conditions in the smaller communities are relatively worse than in the large cities. My figures indicate that 44 per cent of the stations in cities of 1,000,000 population or more are unnecessary. In cities of 500,000 to 1,000,000 the percentage is 47; in cities of 250,000 to 500,000 the percentage of unnecessary stations is 53; and in cities of 100,000 to 250,000 the percentage is 59. A slight improvement is shown in the group of cities ranging in population from 50,000 to 100,000. In this group 56 per cent of the stations are unnecessary, but in the next group the percentage increases to 65. Considering these six groups as a whole, approximately 60 per cent of their stations are not warranted. Unfortunately, there are more than 43,000 stations in villages and rural sections where no station should have been built. This means that for the country as a whole, 71 per cent of the stations are unnecessary. It is highly probable that errors have been made in the count, but with few exceptions it is reasonable to assume that they have been errors of omission. The true conditions are probably worse than these figures indicate.

"In estimating the capital investment represented by unnecessary service stations and unnecessary bulk plants, I have tried to be ultraconservative. The total is not less than $1,000,000,000, including value of land.

"Prior to the period of excessive expansion in the distributing branch of the industry, the average allowance to dealers was 2 cents a gallon. The average today is not less than 4 cents a gallon, and in many sections it is considerably more. This does not refer to the spread between the tank wagon and service station prices, but to the total spread between the net price actually paid by the dealer and the retail price exclusive of tax.

"Operating expenses of company-owned service stations have shown a corresponding increase during this period. Furthermore, the average unit cost of bulk plant operation and tank wagon deliveries has increased at least one-half cent a gallon. The industry will doubtlessly admit that the chief reason for this increase in operating costs is the direct and indirect effects of overbuilding, which has steadily reduced the average gallonage of stations. This increased operating cost, including depreciation of unnecessary stations, now totals more than $455,000,000 annually, without allowing for any return on more than $1,000,000,000 of wasted capital. Overdevelopment in one branch of the industry is costing almost 4 per cent a year on the total investment in all branches.

"The remedy for these conditions is not to be found in agreements or in resolutions or in appeals for governmental action. A readjustment is inevitable. Fundamental economic principles cannot be disregarded indefinitely. The companies who adopt sound practices will survive and grow stronger; those who cling to unsound practices will pass into the discard."

EAST AND EAST CENTRAL TEXAS WILDCATS

(Continued from Page 31)

Worthen Pet. Co.'s No. 1 Cerf, 2½ miles NE of Ennis...Oil and gas shows; T.D. 2,269 ft.

FRANKLIN COUNTY

Tom Harper's No. 1 fee, 150 ft. from N line and 200 ft. from E line of 116-ac. tr., W. M. Dawson Sur. .. S.D. 1,000 ft.

GREGG COUNTY

P. J. Alco's No. 1 F. Thomas, 160 ft. from S line and 150 ft. from W line of 10-ac. lease, C. H. Alexander Sur. ....Drlg. 3,440 ft.

Barnsdall Oil Co.'s No. 1 Adams, 330 ft. S and E of NE cor. of Shell's Slaton lease, G. W. Hooper Sur....Drlg. 3,592 ft.

M. T. Beeler's No. 1 Finley and Thomas, 150 ft. from N and 150 ft. from W of 10-ac. lease, C. H. Alexander Sur. ....Derrick.

Big Indian Oil Co.'s No. 1 W. R. Nicholson, 330 ft. from S line and 4,783 ft. from E line of tract, M. Mann Sur. ....Derrick.

J. B. Bond et al's No. 1 J. H. Alexander, center of S 10 acres of N 20 acres of 50-ac. tract, D. Sanches Sur. ....Rig up.

Will Brown's No. 1 E. Choice, 400 ft. due east of Collins' No. 1 H. T. Elder ....Derrick.

Byrd-Frost Oil Co.'s No. 1 Alexander and Strong, 330 ft. from S and E lines of 26-ac. tract, M. Tennison Sur. ....Drlg. 3,642 ft.

D. D. D. Oil Co.'s No. 1 Sarah Dansby, 283 ft. from N and S lines and 330 ft. from E line of lease, W. P. Chisum Sur. ....S.D. 2,100 ft.

Demotte et al's No. 1 T. L. Bray, center of Blk. No. 8, H. R. Hokit Sur. ....Testing 3,610 ft.; T.D. 3,642 ft.

Dodd and Markey's No. 1 J. F. Holt, 615 ft. E and 707 ft. N of SW cor. of 200-ac. tract, H. Edwards Sur...Derrick.

East Texas Refining Co.'s No. 1 J. W. Fuller, 330 ft. from W line and 300 ft. from S line of 50-ac. lease, D. Sanches Sur. ....Drlg. 2,710 ft.

Farland et al's No. 1 Alexander, center of 10-ac. lease in center of 50-ac. tract, D. Sanches Sur. ....Drlg. 2,830 ft.

Glasscock Bros.' No. 1 E. Bade, 157 ft. from S line and 409 ft. from W line of lease, G. W. Hooper Sur. ....Drlg. 3,600 ft.

Lewis Godlin's No. 1 E. L. Walker, 330 ft. N of road, 330 ft. from E line of 80.2-ac. tract, M. Dillard Sur...Derrick.

Gulf Production Co.'s No. 1 A. King, 120 ft. E and 330 ft. N of SE cor. of church, John Moffit Sur....Drlg. 2,937 ft.

Gulf Production Co.'s No. 1 E. L. Walker, 810 ft. N and 370 ft. W of SE cor. of lease, John Tate Sur....Drlg. 2,625 ft.

Gulf Production Co.'s No. 1 Nichols, 330 ft. from N line and 344 ft. from W line of lease, D. Dainwood Sur. ....Drlg. 3,510 ft.

Hastings et al's No. 1 Wallace, due SE offset to Victory Smith's No. 1 Knowles, M. Tennison Sur. ....T.D. 2,025 ft.

J. F. Heard's No. 1 fee, 200 ft. SW of Pace's No. 1 Elder, Mary Van Winkle Sur. ....Derrick.

D. W. Henke's No. 1 J. M. Christian, center of 2.9-ac. tract, G. W. Hooper Sur. ....Drlg. 1,650 ft.

Inland Oil Co.'s No. 1 J. A. Knowles, 150 ft. from S line and 330 ft. from W line of 17-ac. lease, John Blair Sur. ....Drlg. 3,515 ft.

Jackson and Bradstreet's No. 1 M. Young, center 2-ac. tract, J. R. Crosby Sur. ....Waiting on cmt. to set 3,495 ft.

K. B. Oil Co.'s No. 1 Dickson, 150 ft. from S and 150 ft. from W of 5-ac. lease, Mary Van Winkle Sur.....S.D. 700 ft.

Landes et al's No. 1 M. B. Hughey, Blk. No. 118, Kilgore Townsite, Mary Van Winkle Sur. ..... Waiting on cmt. to set 3,519 ft.
W. T. Lee et al's No. 1 fee, 125 ft. from NW line and 95 ft. from NE line of Blk. No. 37, H. R. Hokit Sur. ..... Drlg. 2,910 ft.
Lucy Petroleum Co.'s No. 1 B. C. Christian, 330 ft. from W line and center of N and S lines of 8-ac. lease, G. W. Hooper Sur. ..... S.D. 890 ft.
Magnolia Petroleum Co.'s No. 1 Zeigler, 330 ft. out of NW cor. of 50-ac. lease, B. N. Hampton Sur. ..... Drlg. 300 ft.
McBride's No. 1 F. Elder, 205 ft. ft. N and 320 ft. W of SE cor. of 26-ac. lease, John Wilkerson Sur. ..... Drlg. 2,777 ft.
McLemore et al's No. 1 Adkins, 330 ft. N and 150 ft. W of SW cor. of Gulf Lingley lease, D. Dainwood Sur. ..... Drlg. 1,232 ft.
Jim McMurray et al's No. 1 J. H. Alexander, center of E 2 acres of 50-ac. tract, D. Sanches Sur. ..... Derrick.
National Oil Co.'s No. 1 L. Martin, 330 ft. from N and W lines of 20-ac. lease, W. P. Chisum Sur. ..... Waiting on cmt. to set 3,730 ft.
Newman et al's No. 1 A. V. Bacle, 426 ft. S and 250 ft. W of NW cor. of Barnsdall's McGrede lease, G. W. Hooper Sur. ..... Location.
J. D. Patty, et al's No. 1 J. C. McCormick, 207 ft. SE at right angles to Gladewater-Tyler road and 540 ft. SW of Abernathy and Kirkpatrick's No. 1 Gregston, M. Dillard Sur. ..... T.D. 100 ft.
E. A. Payne et al's No. 1 R. M. Woods, 20 ft. from S line and 31 ft. from W line of 2.13-ac. lease, H. R. Holit Sur. ..... Derrick.
Perry-Crews' No. 1 Clayborn, 246 ft. S along E line of C. G. Strong 50-ac. tract, I. Baty Sur. ..... Rig up.
Peterson and Merritt's No. 1 Hem, center of 1-ac. tract of SW cor. of Meridian's Lee lease, L. J. Rigsby Sur. ..... Drlg. 3,552 ft.
Pilot Oil Co.'s No. 1 H. Smith, center of 3.87-ac. lease, William Robinson Sur. ..... Drlg. 2,640 ft.
Pruitt and Standberry's No. 1 M. B. Hughey, Blk. No. 150, Kilgore Townsite, Mary Van Winkle Sur. ..... Derrick.
Reeves et al's No. 1 W. L. Heatland, center of five-eighths-acre tract, midway from Lampton Church and Sarson's No. 3 Hall, D. Sanches Sur. ..... Derrick.
Ross et al's No. 1, located on Findley & Thomas 50-ac. tract, 150 ft. from S line and 6.66-ac. lease, C. H. Alexander Sur. ..... Derrick.
Frank Russell's No. 1 M. Dickson, Blk. No. 184, Kilgore Townsite, Mary Van Winkle Sur. ..... Drlg. 2,300 ft.
Shell Pet. Corp.'s No. 1 S. C. Fishborn, 330 ft. from N and E lines of 100-ac. lease, F. W. Johnson Sur. ..... Location.
Shell Petroleum Corp.'s No. 1 M. J. Register, 370 ft. from N line and center of E and W lines of 50-ac. tract, D. Dainwood Sur. ..... Testing 3,640 ft.; T.D. 3,662 ft.
Shewers and Moncrief's No. 1 J. M. Christian, 177 ft. from N and S lines and 265 ft. from E and W lines of 4.33-ac. lease, G. W. Hooper Sur. ..... Derrick.
Silver Star Gas Co.'s No. 1 Knight and Tabor, center of one-half-acre tract, L. B. Outlaw Sur. ..... Waiting on cmt. to set 3,603 ft.
Silver Star Oil Co.'s No. 1 Thad Snoddy, 125 ft. from N line and 250 ft. from W line of W 3 acres of 4-ac. tract, W. H. Castleberry Sur. ..... Waiting on cmt. to set 3,526 ft.
V. C. Smith's No. 1 M. B. Hughey, center of Blk. No. 123, Mary Van Winkle Sur. ..... Set surface csg.
Victor C. Smith's No. 1 Knowles, center of Blk. 134, Mary Van Winkle Sur. ..... Derrick.
Solar Exploration's No. 1 J. Elder, 300 ft. NE of Solar's No. 1, Mary Van Winkle Sur. ..... Drlg. 2,740 ft.
Thompson's No. 1 Cole, E offset to Petroleum Finance's No. 2 Lacy, M. T. Cole Sur. ..... Waiting on cmt. to set 3,525 ft.
T. J. Tucker's No. 1 Mary Rufus, center of one-half-acre tract, Mary Van Winkle Sur. ..... Set surface csg.
Valentine Oil Co.'s No. 1 Goyne-Hughey, 6,100 ft. from S and 6,800 ft. from W of survey, Mary Van Winkle Sur. ..... Rig up.
Westheimer and Doby's No. 1 J. T. Florence, 606.3 ft. from S line and 123 ft. from W line and 474 ft. from E line of lease, Mary Van Winkle Sur. ..... Drlg. 2,600 ft.
Wiseman et al's No. 1 C. Jones, center of 45-ac. tract, G. W. Hooper Sur. ..... Derrick.
H. E. Wrenn's No. 1 A. A. King, 150 ft. from S and E lines of 79-ac. lease, W. P. Chisum Sur. ..... Derrick.

HILL COUNTY

Sherman-Houseman's No. 1 J. F. Griffith, in Samuel Waddell Sur. ..... S.D. 3,256 ft.

HOPKINS COUNTY

Roark et al's No. 1 Taylor, 220 ft. from N and W lines of 80-ac. tract in the John Polk Sur. ..... S.D. 540 ft.

HOUSTON COUNTY

Ramsland and Ramsland's No. 1 Pennington, 750 varas W of E line and 500 varas from S line of survey on 186-ac. tract, Ramond LaGarza Sur. ..... Drlg. 2,509 ft.
C. T. McManus' No. 1 Harron, 300 ft. out of NE cor. of 327-ac. tract, J. P. Procella Sur. ..... Spudded and S.D. 37 ft.

HUNT COUNTY

Branson et al's No. 1 Gray ..... Location.
Russell et al's No. 1 Brooks and Quattlebaum ..... S.D. 1,455 ft.

KAUFMAN COUNTY

Standy Darnell et al's No. 1 Sally Pannill ..... T. D. 1,500 ft.

LAMAR COUNTY

G. W. Davy et al's No. 1 McGustion, 450 ft. from S line, 450 ft. from W line of farm and survey, Galet Wood Sur. ..... S.D. 2,880 ft.
Doyle and Jondeau's No. 1 Martin, 990 ft. from N line and 330 ft. from E line of tract, Joseph Deck Sur. ..... Drlg. 850 ft.
Doyle and Jondeau's No. 1 Horn, 226 ft. from S line and 608 ft. from E line of lease, R. P. Mayor Sur. ..... S.D. 2,254 ft.

LEON COUNTY

Salzer Drlg. Co.'s No. 1 Dr. J. M. Blair, 1,010 ft. from N line, 1,986 ft. from W line, Sec. 19, Blk. E, Lucia Hibbard Sur. ..... Derrick on ground.

MORRIS COUNTY

Leonard's (Tucker-Fullwood) No. 1 P. M. Staggers, 450 ft. from N line and 150 ft. from E line of 65.5-ac. tract, J. D. Nelson Sur. ..... Drlg. 3,550 ft.

NACOGDOCHES COUNTY

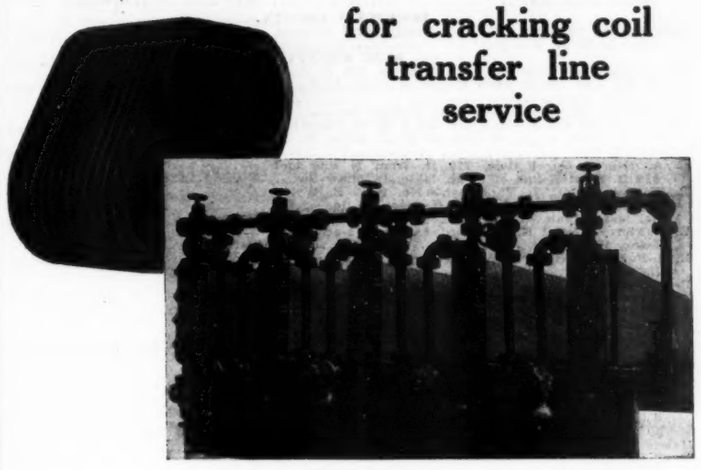
Adams et al's No. 1 Fuller Brothers, located in a 269-ac. tract, Jose Flores Sur. ..... Location.
Gainer et al's No. 1 Nice Well, 18 miles SE of Nacogdoches, 600 ft. from S and 150 ft. from W of Wells tract in A. Cherino Sur. ..... S.D. 3,430 ft.
Joiner and Henson's No. 1 Andy Legg, 330 ft. from N and 330 ft. from W of tract, John Durst Sur. ..... S.D. 3,920 ft.
Scully & Harwell's No. 1 R. L. Driver, 1,500 ft. from SE cor. of P. B. Ballard 135-ac. tract, 15 miles SE of Nacogdoches in Patricia De Torres Sur. ..... S.D. 3,808 ft.
Taylor-Vaughn's No. 1 Dixon Greer, 160 ft. from W and 450 ft. from N lines of 60-ac. tract in the M. G. Horrera Sur. ..... S.D. 265 ft.
Creighton Drlg. Co.'s No. 1 J. N. Stewart, center of 79-ac. tract in the Jose Ignacio Y. Barbo Sur. ..... S.D. 3,226 ft.

POLK COUNTY

Humble Oil & Refining Co.'s No. 2-A West Texas Lumber Co., 1,902 ft. S and 70 deg. W along property line from N cor. of survey, thence 100 ft. SW of right of way, M. Chavence Sur. ..... Drlg. 1,433 ft.
Sunshine Oil Co.'s No. 1 Brawley, 150 ft. from S line and 250 ft. from E line of W 100 acres of lease, F. Johnson Sur. ..... Derrick.

A practical heat exchanger

for cracking coil transfer line service



The G-R Tubeflo Section Type KC

The G-R Tubeflo Section, Type KC, consists of four straight parallel tubes with a stationary head containing the pipe connections at one end, and a floating head containing the return connections at the other end. The tubes are surrounded throughout their entire length by closely-spaced diamond-shaped fins, each fin embracing all four tubes. The tubes are expanded into both heads and fins in a single operation, assuring thorough contact with the fins and permanent tightness of all connections. The hot liquid passes and returns through two diagonally opposing tubes and the colder liquid passes and returns through the other pair of tubes. The many fins surrounding the tubes conduct the heat from the tubes carrying the hot liquid to the tubes carrying the cooler liquid.

THE excess heat in the hot high pressure liquid from pipe heaters for cracking or reforming units is usually wasted because of difficulties encountered with ordinary shell-and-tube heat exchangers due to high temperature and fouling.

This heat can be successfully transferred to the cracking coil charging stock by means of a G-R Tubeflo Section, Type KC, designed for temperatures up to 950 deg. fahr. In this unit, sediment or sticky tar is carried completely through the large straight tubes because of the high and uniform velocity of the liquids.

Besides the material saving in fuel obtained by the use of G-R Tubeflo Sections on transfer line service, the use of these units permits a reduction in the size of the pipe heater on new installations, or allows considerably more oil to be charged through the heater on existing installations. An additional advantage is that by heating the incoming oil, they provide greater cracking effort because of the resulting increase in the average temperature of the oil passing through the heater.

G-R Tubeflo Sections, Type KC, are being used on a large variety of difficult heat transfer services which cause rapid clogging of usual shell-and-tube designs but we know of no instance in which Tubeflo Sections have failed to maintain their rated capacity.

Write for full information.

THE GRISCOM-RUSSELL CO.
285 Madison Ave., New York
Branches in principal oil centers

Griscom-Russell
Heat Transfer Apparatus

RAINS COUNTY

C. H. Bayliss' No. 1 Ownby, 150 ft. N and 1,100 ft. from E of most easterly SE cor. of survey, Alexander Sur. ..... S.D. 4,036 ft.; to drill deeper.
Greer et al's No. 1 Roy Harper, 150 ft. from S line and E line of tract, 4 miles N of Ginger, David Rose Sur. ..... S.D. 1,400 ft.

RED RIVER COUNTY

Hoffman and Henson's No. 1 H. H. Lennox, 2,790 ft. W and 300 ft. S of most easterly NE cor. of survey, J. E. Edmondson Sur. ..... S.D. 60 ft.
Concord Oil Co.'s No. 1 J. R. Dellahunty, 600 ft. from N of Isaac Moore Sur. and 200 ft. E of E line of Robert Glass Sur. ..... S.D. 2,345 ft. (corrected).

ROCKWALL COUNTY

Bucanner Oil Co.'s No. 1 H. L. Lofland, center of 69-ac. tract in W. M. Bird Sur. ..... Set 10-in. csg. 120 ft.

RUSK COUNTY

Butler and Calhoun's No. 1 C. C. Lowe, 225 ft. from N line and 200 ft. from E line of 85-ac. lease, W. G. Tutt Sur. ..... Derrick.
Byrd-Frost's No. 1 Buckner, J. E. Peyton Sur. ..... Drlg. 3,994 ft.
Cordova Union Oil & Gas Co.'s No. 1 C. O. Christian, 330 ft. from S and E lines of 40-ac. lease, W. A. Elliott Sur. ..... Drlg. 2,460 ft.
C. A. Everts' No. 1 Cole, 210 ft. from N line and 330 ft. from E line of 50-ac. lease, D. Shaw Sur. ..... Fishing 3,321 ft.
R. W. Fair and C. L. Thompson's No. 1 W. E. Wylie, 330 ft. from S line and 330 ft. from W line of 27-ac. lease, Juan Ximenes Sur. ..... Rig up.
E. P. Florey's No. 1 E. B. Alford, center of 3-ac. lease, Isaac Parker Sur. ..... Derrick.
E. E. Fogelson's No. 1 D. Wadley, center of 15-ac. tract, D. Clark Sur. ..... Drlg. 2,150 ft.
P. T. Fullwood's No. 1 W. N. Brightwell, 275 ft. E of Horse Shoe Syndicate's No. 1 Brightwell, R. E. Winn Sur. ..... S.D. 3,622 ft.
Great Eastern Oil Co.'s No. 1 C. O. Christian, 150 ft. from N line and 330 ft. from E line of lease, J. S. Whiteman Sur. ..... Waiting on cmt.; T.D. 3,744 ft.
Gulf Production Co.'s No. 1 A. H. Rayford, 301 ft. from N line and 330 ft. from E line of 59.87-ac. lease, F. Cordova Sur. ..... Drlg. 3,115 ft.
Hale and Hatchfield's No. 1 C. J. Goforth, 625 ft. from S line and 450 ft. from W line of 13.4-ac. tract, M. J. Pru Sur. ..... Rig up and S.D.
Harris and Russell's No. 1 T. W. Harris, 330 ft. from S line and 660 ft. from W line of most southerly SW cor. of 160-ac. tract, 3 miles SW of Henderson, W. G. Davis Sur. ..... Derrick.
Hathaway et al's No. 1 Gray, J. M. McLain Sur. ..... S.D. 3,365 ft.
Heiden-Rodgerson et al's No. 1 Barton and Birdwell, N offset to Reisinger et al's No. 1 Barton, W. G. Tutt Sur. ..... Drlg. 2,100 ft.
Holland et al's No. 1 S. E. Brox, 330 ft. from N line and 250 ft. from W line of 20-ac. lease, Thomas Grey Sur. ..... Derrick.
Howell's No. 1 Irion and Motley, 200 ft. from N line, 1,270 ft. from W line of survey, J. Lindley Sur. ..... Drlg. 3,697 ft.
Hudspeth's No. 1 E. B. Alford, center of Lot No. 35, T. J. Moore Sur. ..... Derrick.
T. F. Hunter's No. 1 J. Johnson, 330 ft. from E line and 171 ft. from N line of 13-ac. lease, H. B. Dance Sur. ..... Waiting on cmt. to set 3,773 ft.
LaSalle-Davenport and Biedsoe's No. 1 Church, 175 ft. S and 175 ft. E of SE cor. of Sun-Schuler joint lease, J. B. DeCadena Sur. ..... Rig up.
McPhail and Kimbrough's No. 1 E. A. Thrash, 150 ft. from N and W line of 4-ac. lease, Juan Ximenes Sur. ..... Drlg. 200 ft.
Moss and Urschel's No. 1 H. L. Griffin, 200 ft. from N line and 150 ft. from W line of 20-ac. lease, Juan Ximenes Sur. ..... T.D. 3,749 ft.; to deepen.
Mid-Kansas Oil & Gas Co.'s No. 1 Jim Lunsford, 460 ft. from S line and 330 ft. from W line of 66.6-ac. lease, J. B. DeCadena Sur. ..... Drlg. 2,760 ft.
Mid-Kansas Oil & Gas Co.'s No. 1 George W. Moore, 425 ft. from N line and 330 ft. from S line and 1,105 ft. from E line of 85-ac. tract, W. J. Roan Sur. ..... Drlg. 3,493 ft.
Geo. L. Pace's No. 1 E. B. Alford, center of 5-ac. lease, T. J. Moore Sur. ..... T.D. 3,604 ft.
Pace Petroleum Co.'s No. 1 Wells, W offset to East Texas, W. P. Chisum Sur. ..... Derrick.
Pansy Oil Co.'s No. 1 E. B. Alford, center of Blk. No. 50, T. J. Moore Sur. ..... Drlg. 1,400 ft.
Ross Seward's No. 1 Burton, J. J. Y'Barbo Sur. ..... S.D. 3,077 ft.
Sabins et al's No. 1 J. R. Irion, 330 ft. from S and E line of 2-ac. tract, John Womack Sur. ..... Rig up.
R. E. L. Silvey's No. 1 F. G. Warren, 155 ft. from S line and 96 ft. from E line of 44-ac. tract, John Womack Sur. ..... Rig up.
Jay Simmon's No. 1 D. C. Joyner, 2,050 ft. from S line and 300 ft. from W line of 74.11-ac. tract, F. Cordova Sur. ..... Derrick.
Sinclair Oil & Gas Co.'s No. 1 J. W. Ashby, 300 ft. from S and W lines of 54.77-ac. lease, William Clark Sur. ..... T.D. 3,681 ft.; top sand 3,662 ft.
Sinclair Oil & Gas Co.'s No. 1 D. Ledbetter, 330 ft. from N and E lines of 191-ac. tract, T. M. White Sur. ..... Drlg. 1,250 ft.
Spansco Oil Co.'s No. 1 J. R. Alford, center of Lot No. 33, T. J. Moore Sur. ..... Spudding.
J. E. Stone Lumber Co. and Imperator Oil Co.'s No. 1 School Lot, center of School Lot, J. B. Cadena Sur. ..... Set surface csg.
Weaver-Crim Corp.'s No. 1 M. E. Peterson, 330 ft. from S line and center of E and W line of lease, W. P. Chisum Sur. ..... Waiting on cmt. to set; T.D. 3,610 ft.
Weaver-Crim's No. 1 F. Bean, 175 ft. from NW line and 212 ft. from S line of 16-ac. lease, Mary Cogswell Sur. ..... Derrick.

JOINER POOL—RUSK COUNTY

Armstrong's No. 1 Alford, 151 ft. from S and 1,080 ft. from W of survey, T. J. Moore Sur. ..... Derrick.
Paulett et al's No. 1 Ed Sparks, 350 ft. from E, 150 ft. from S of survey, L. C. Riggs Sur. ..... S.D. 1,465 ft.

SAN AUGUSTINE COUNTY

A. H. Jones and Tennant's No. 1 A. P. Davis ..... Drlg. 3,250 ft.

SMITH COUNTY

Acme Oil Co.'s No. 1 Horton, 330 ft. from N and W lines of tract, Mar Sewell Sur. ..... Drlg. 3,580 ft.
British-American's No. 1 M. L. Thompson, 330 ft. from N and W lines of 64.52-ac. lease, Isaac Moore Sur. ..... Derrick.
Deaner and Reynolds' No. 1 J. B. Wilson, 330 ft. from S and W lines of 20-ac. lease, James Jordan Sur. ..... Drlg. 2,150 ft.
Hasmussen et al's No. 1 S. S. Cooke, 723 ft. E and 554 ft. S of SW cor. of Mayfield 99-ac. tract, Juan Vargus Sur. ..... S.D. 2,900 ft.
Hamp Florence's No. 1 S. S. Cooke, 150 ft. from S and E lines of 20-ac. lease, Juan Vargus Sur. ..... Drlg. 2,757 ft.
Hawkins and Sutton's No. 1 Church, 345 ft. from S line and center of E and W lines of 8.75-ac. lease, James Jordan Sur. ..... Drlg. 1,950 ft.
J. E. Lucas' No. 1 Henry Jackson, 150 ft. from N and E lines of 25-ac. tract, James Jordan Sur. ..... Rig up and S.D.
Nash and Bloxom's No. 1 Frank Cole, 330 ft. from S and E lines of 67-ac. tract ..... Drlg. 2,150 ft.
Lucas & Hobbe's No. 1 L. S. Sartin, 214 ft. from S line and 330 ft. from E line of 10-ac. lease and 76-ac. tract, James Jordan Sur. ..... Drlg. 2,875 ft.
Weaver-Crim Corp.'s No. 1 Stone and Lee, 330 ft. from E line and 530 ft. S of Sessions' No. 1 Attaway, D. Shaw Sur. ..... Set surface csg.
Zion Oil Co.'s No. 1 Sartin, 665 ft. N and 328 ft. W of SW cor. of Mayfield 94-ac. tract, James Jordan Sur. ..... Set surface csg.

TITUS COUNTY

Perry V. Cook's No. 1 M. C. Rogers, center of SW of Moore Sur. ..... S.D. 3,860 ft.

UPSHUR COUNTY

L. G. Bradstreet et al's No. 1 O. M. Victory, 330 ft. from N and E lines of 10-ac. lease, E. A. J. Evans Sur. ..... Location.
Pat Hudson et al's No. 1 D. F. Smith, 330 ft. out of SE cor. of W 100 acres of the N 200 acres of the 272-ac. lease, 3 miles E and 1½ miles N of Cranfill & Reynolds' No. 1 Rash, John Denson Sur. ..... Derrick.
J. C. McFarland et al's No. 1 Willie Starr, center of S 40 acres of Starr 96-ac. tract, Charles Cooper Sur. ..... S.D. 3,250 ft.
Saturn Oil Co.'s No. 1 W. F. Smith, 330 ft. from E line and center of N and S lines of S 25 acres of W 50 acres of 100-ac. tract, J. Pineda Sur. ..... T.D. 3,716 ft.; plugged back to 3,704 ft.
L. E. Trout et al's No. 1 O. M. Victory, 330 ft. from S and E lines of 60-ac. lease, E. A. J. Evans Sur. ..... Derrick.
Wadley and Evans' No. 1 Oliver, 330 ft. out of NE cor. of the W. half of survey on a 160-ac. tract, S. Saunders Sur. ..... Coring 3,785 ft.
Webster's No. 1 R. H. McClelland, 1,956 ft. E and 385 ft. S of NW cor. of 751-ac. tract, M. P. Del Torres Sur. ..... Derrick.

VAN ZANDT COUNTY

Barton et al's No. 1 C. L. Hubbard, 600 ft. out of NE cor. of Hubbard 225-ac. tract, 3½ miles S of Canton, M. J. DeCadena Sur. ..... S.D. 2,104 ft.
Humble Oil & Refining Co.'s No. 1 J. F. McPherson, 308 ft. E of W line and 200 ft. N of S line of lease, William Daniel Sur. ..... T.D. 2,959 ft.; testing.
Kelly O. & G. Co.'s No. 1 Lemsford, center of Lemsford tract, John Conner Sur. ..... S.D. 2,300 ft.
Pure Oil Co.'s No. 1 R. Clark, 910 ft. S of N line and 704 ft. W of E line of lease, Phillip Mason Sur. ..... Derrick.
Pure Oil Co.'s No. 2 A. R. Humphreys, 200 ft. S of N line and 225 ft. E of W line of lease, A. McPhail Sur. ..... Testing 2,989 ft.
Pure Oil Co.'s No. 2 P. E. Neill, 329 ft. N of S line and 59 ft. E of W line of lease, John Walling Sur. ..... Rigging up.
Pure Oil Co.'s No. 3 Mrs. C. White, 250 ft. E of W line, 250 ft. S of N line, John Walling Sur. ..... Derrick.
Pure Oil Co.'s No. 4 R. E. Cade, 200 ft. N of S line and 225 ft. E of W line of lease, A. McPhail Sur. ..... Cmt. setting 307 ft.
Pure Oil Co.'s No. 4 L. A. Smith, 635 ft. N of S line and 683 ft. E of W line of lease, John Walling Sur. ..... Cmt. setting 305 ft.
Pure Oil Co.'s No. 5 R. E. Cade, 225 ft. S of N line and 225 ft. E of W line of lease in A. McPhail Sur. ..... Location.
Pure Oil Co.'s No. 7 N. E. Clark, 600 ft. S of N line and 225 ft. E of W line of lease in J. Prado Sur. ..... Running tubing 2,946 ft.
Pure Oil Co.'s No. 9 A. R. Tunnell, 644 ft. N of S line and 250 ft. W of E line of lease, John Walling Sur. ..... Derrick.
Van Oil Association's No 1 Tankersley, 200 ft. from E and 1,000 ft. from S of farm, L. Landers Sur. ..... S.D. 2,761 ft. (corrected).

WOOD COUNTY

Talko Oil Co.'s No. 1 G. T. Ross, B. L. Smith Sur. ..... S.D. 2,760 ft.
Wood County Dev. Co.'s No. 1 Davis, approximately 180 ft. from S line of 160-ac. tract and 2½ miles S of Kantes in Sarah McDonald Sur. ..... Moving in rig.

WILDCAT OPERATIONS IN TEXAS PANHANDLE

(Continued from Page 32)

Nipper et al's No. 1 Morse, 330 ft. from N and E, Sec. 1, Blk. 26, I.&G.N. Sur. ..... Fishing 2,635 ft.
Operators Royalty & Prod. Co.'s No. 2 Arnold, 330 ft. from S and W, Sec. 149, Blk. 3, I.&G.N. Sur. ..... Rig.
Parton & Holt's No. 2 Morse, 330 ft. from W, 250 ft. from N, W½ SW, Sec. 5, Blk. 26, H.&G.N. Sur. ..... Rig.
Pulse-Shell Pet. Corp.'s No. 1 Wright, 330 ft. from S and W of Sec. 13, Blk. 3, I.&G.N. Sur. ..... 1,300 bbls. in 18 hrs.; T.D. 2,356 ft.
Prairie Oil & Gas Co.'s No. 1 Pope, 330 ft. from N and E, Sec. 173, Blk. 3, I.&G.N. Sur. ..... T.D. 3,265 ft; T.P. 3,100 ft; to shoot.
Saunders et al's No. 2 Sullivan, 822 ft. from W. and 231 ft. from NE, 160 ft. S, 264 ac. of N½, Sec. 136, Blk. 3, I.&G.N. Sur. ..... Will plug back to 3,275 ft. and shoot.
Skelly Oil Co.'s No. 26 Schaffer, 330 ft. from S and W, Sec. 172, Blk. 3, I.&G.N. Sur. ..... Drlg. 3,265 ft; T.P. 3,170 ft; 1,400 ft. oil in hole at 3,200 ft.
Skelly Oil Co.'s No. 28 H. Schaffer, 440 ft. from S line and 440 ft. from E line of NE Sec. 189, I.&G.N. Sur., Blk. 3 ..... Drlg. 1,890 ft.
Skelly Oil Co.'s No. 29 Schaffer, 440 ft. from S and W, Sec. 171, Blk. 3, I.&G.N. Sur. ..... Bldg. rig.
Skelly Oil Co.'s No. 30 Schaffer, 220 ft. from N, 440 ft. from W, Sec. 172, Blk. 3, I.&G.N. Sur. ..... Location.
Skelly Oil Co.'s No. 31 Schaffer, 1,320 ft. from S, 440 ft. of N½, Sec. 189, Blk. 3, I.&G.N. Sur. ..... Location.
Stanolind Oil & Gas Co.'s No. 2 Waggoner, 330 ft. from N and W, Sec. 173, Blk. 3, I.&G.N. Sur. ..... Drlg. 3,020 ft.
Tarber's No. 1 Saunders, 330 ft. N and W, Sec. 3, Blk. 1, B.B.&S.F. Sur. ..... Location.
Travis' No. 3 Back, 330 ft. from S, 2,300 ft. from E, Sec. 44, Blk. 25, H.&G.N. Sur. ..... Rigging up standard tools.
Warner Oil Co.'s No. 2 Chapman, 382 ft. N, 220 ft. W of E 20 ac. of N½ NW, Sec. 69, Blk. 25, H.&G.N. ..... Location.

HUTCHINSON COUNTY

Baso's No. 1 Moore, 330 ft. from S and 330 ft. from E, in 80 ac. in NW, Sec. 21, Blk. M-21, T.C.R.R. Sur. ..... S.D. 2,220 ft.
Combination O. & G. Co. and Alspaugh's No. 1 Johnson, 330 ft. from S line, 330 ft. from E line of NW SW, Sec. 4, Blk. Y, A.&B. Sur. ..... Drlg. 1,800 ft.
Danciger O. & R. Co.'s No. 1 Johnson, 330 ft. N and W, SE, Sec. 34, Blk. Y, A.&B. Sur. ..... Spudded and S.D.
Deal O. & G. Co.'s No. 2 Sanford, 330 ft. N and E of N 80 ac., S 160 ac., Sec. 81, Blk. 46, H.&T.C. Sur. ..... S.D. 450 ft.
Huber Prod. Co.'s No. 1 Johnson Bros. (Premier), 330 ft. N and E of W 60 ac., N 80 ac., NW, Sec. 3, Blk. Y, A.&B. Sur. ..... S.D. 3,125 ft.; I.P. 10 bbls. per hr. and 500,000 ft. gas.
Huber Pet. Co.'s No. 1-A Weatherly, 330 ft. from N and W, Sec. 26, Blk. Y, A.&B. Sur. ..... Rig.
Liner Drlg. Co.'s No. 1-D Johnson, 330 ft. from N and E, Sec. 6, Blk. 1, B.&B. Sur. ..... Drlg. 3,150 ft.
Oates and Marrow's No. 1 W. A. Starnes, C SE SW SE Sec. 24, M-23 T.C.R.R. Sur. ..... Drlg. 1,500 ft.

Pharis Oil Co.'s No. 5 Smith, 660 ft. from N and W, SW. Sec. 14, Blk. Y, M.&C. Sur. ..... Spudded.
Timms-Deatch's No. 4 Moore, 330 ft. N and W, Sec. 124, Blk. 4, I.&G.N. Sur. ..... Rig.

LIPSCOMB COUNTY

Okla. Public Service Co.'s No. 1 C. W. Jones, NE SW, Sec. 100, H.&T.C. Sur. ..... T.D. 5,003 ft.

MOORE COUNTY

Dogie Oil Co.'s No. 1 Greenwald, 330 ft. from N and W, Sec. 277, Blk. 44, H.&T.C. Sur. ..... Spudded and S.D.
Dana O. & G. Co.'s No. 1 Robertson et al, 330 ft. from S and E, Sec. 165, Blk. 3-T, T.&N.O. Sur. ..... Cellar.
Interstate's No. 1 Nield, C NE, Sec. 18, Blk. 44, H.&T. C. Sur. ..... Rig up.
Magnolia Pet. Co.'s No. 1 Nield, 330 ft. from S and E of N½, Sec. 361, Blk. 44, H.&T.C. Sur. ..... Standardizing 3,395 ft.
Pollard et al's No. 1 Hall, 330 ft. S and E, NE, Sec. 121, Blk. 2-T, T.&N.O. Sur. ..... Rig on ground.
Sunray Oil Co.'s No. 2 Jones, 330 ft. N and W, W½ SW, Sec. 164, Blk. 3-T, T.&N.O. Sur. ..... Rig on ground.
Sunset Oil Co.'s No. 1 R. O. Brumley, 330 ft. from N line and 330 ft. from W line of SW, Sec. 360, H.&T.C. Sur. ..... T.D. 2,805 ft; drlg. plug.
Sunset Oil Co.'s No. 1 Dore, 330 ft. from N and W, W½, Sec. 318, Blk. 44, H.&T.C. Sur. ..... Set 12-in. at 800 ft.

MOTLEY COUNTY

Matador Oil Corp.'s No. 1 Owens, C NE, Sec. 10, Blk. G, B.&B. Sur. ..... S.D. 530 ft.

OLDHAM COUNTY

Amalgamated German-American Oil Corp.'s No. 1 Norton, 330 ft. S and E, Sec. 12, T.&N.O. Sur. ..... S.D. 400 ft.
Chambers et al's No. 1 Herring, CNL, Sec. 20, Blk. S, G.C.&S.F. Sur. ..... S.D. 3,555 ft.

PARMER COUNTY

Magnolia Pet. Co.'s No. 1 Wilson, 330 ft. from N and W, SE Sec. 73, H. Kelly Sur. ..... Drlg. 4,310 ft.

ROBERTS COUNTY

Chicken Creek Oil Co.'s No. 1 Ledrick, 330 ft. N and W, Sec. 55, Blk. C, G.&M. Sur. ..... T.D. 3,990 ft.
Travis et al's No. 1 Cunningham, 330 ft. S and W, Sec. 74, Blk. M-2, H.&G.N. Sur. ..... S.D. 2,690 ft.

WHEELER COUNTY

Devore & Robinson's No. 1 Sitter, 2,310 ft. from S and E of E½ of Sec. 33, Blk. 24, H.G.N. Sur. ..... S.D. 2,193 ft.

WILDCAT OPERATIONS IN WEST TEXAS

(Continued from Page 32)

GLASSCOCK COUNTY

Mann et al's No. 1 fee, 330 ft. from N and 1,980 ft. from E, Sec. 27, Blk. 34, Twp. 3s, T.&P. Sur. ..... T.D. 900 ft.; cmt. csg. 809 ft.
Peck & Service's No. 1 Gillean, 2,310 ft. from S, 1,650 ft. from E, Sec. 21, Blk. 33, Twp. 2s, T.&P. Sur. ..... Location.

GARZA COUNTY

Penny & Posey's No. 1 Justice, 1,980 ft. from S and 1,680 ft. from E of Sec. 25, Blk. 6, H.&G.N. Sur. (3,500-ft. cable tool test) ..... T.D. 3,320 ft.; to run 6⅝-in. csg.

HOWARD COUNTY

American-Maracaibo's No. 5-A Settles, 1,896 ft. from N, 1,884 ft. from W, Sec. 6, Blk. 32, T.&P. Sur. ..... Rig.
Chalk's No. 1 fee, 330 ft. from S and E, Sec. 96, Blk. 29, W.&N.W. Sur. ..... S.D. 1,650 ft.
F. H. E. Oil Co.'s No. 1 Denman, 330 ft. from N, 2,310 ft. from E of Sec. 14, Blk. 30, T.&P. Sur. ..... Drlg. 980 ft.
Green O. & R. Co.'s No. 1 Denman, 990 ft. from S and 2,310 ft. from W, Sec. 14, Blk. 29, Twp. 1s, T.&P. Sur. ..... Spudded and S.D.
Wallace et al's No. 1 Belt, 1,960 ft. from N, 2,640 ft. from W, Sec. 12, Blk. 30-1s, T.&P. Sur. ..... Drlg. 450 ft.

IRION COUNTY

Apollo Oil Co.'s No. 4 Nutt, 504 ft. from N and 1,562 ft. from W of Subd. No. 6, Gonzales County School Land ..... Cellar.
Davis et al's No. 1 Suggs, 1,560 ft. from S and 925 ft. from W, Sec. 3,081, Blk. 28, H.&T.C. Sur. ..... T.D. 6,920 ft.; hole filled 225 ft. with oil in 14 days.
Stanolind Oil & Gas Co.'s No. 1 Williams, 1,320 ft. from S and E of Sec. 1,196, T.T.R.R. Sur. ..... T.D. 7,425 ft.; fishing pipe.

JONES COUNTY

Johnson's No. 1 Huddleston, 165 ft. from S and W of N half of N half of Sec. 39, Blk. 18, T.&P. Sur. ..... Rig.
Grove & Shield's No. 1 Toombs, 1,140 ft. from N and 220 ft. from E, Sec. 25, Blk. 19, T.&P. Sur. ..... Location.
C. S. Spelling et al's No. 1 Lillie, 200 ft. from N and W Sec. 4, E. Miller Sur. No. 2 ..... Location.
Young et al's No. 1 Harrell, 150 ft. from S and E of N half of Sec. 8, O.A.L. Sur. ..... Location.
Abers et al's No. 1 Burton, 150 ft. from S and 175 ft. from E of 43.4-acre tract in G. Martinez Sur. ..... S.D. 1,005 ft.; temp. abnd.
Transcontinental Prod. Co.'s No. 1 Rust, 5,800 ft. N and 995 ft. W of SE cor. J. J. Hughes Sur. 556 ..... Cellar.

LOVING COUNTY

Eppenauer's No. 1 Freels, 1,262 ft. from NE, 410 ft. from NW, Sec. 92, Blk. 1, W.&N.W. Sur. ..... Location.
Wm. Little's No. 1 Hugo Freels, 1,923 ft. from NE lines and 410 ft. from NW line of Sec. 92, W.&N.W. Sur., Blk. 1 ..... Drlg. 2,890 ft.
Martin's No. 1 Freels, 3,514 ft. from NE and 412 ft. from NW of Sec. 93, Blk. 1, W.&N.W. Sur. ..... Drlg. 175 ft.
Covey et al's No. 1 Wheat, 2,310 ft. from SW, 330 ft. from SE, Sec. 3, Blk. 2, W.&N.W. Sur. ..... Bldg. rig.
Eppenauer Drlg. Co.'s No. 1 Allen, 465 ft. from NE and SE, Sec. 4, Blk. 2, W.&N.W. Sur. ..... S.D. 200 ft.
Ervin & Mahres' No. 1 Thrope, 2,310 ft. from E and 330 ft. from S, Sec. 46, Blk. 53, T.&P. Sur. ..... S.D. 2,500 ft.
Falbre & Evans' No. 1 Dean, 330 ft. from NE and 990 ft. from NW, Sec. 79, Blk. 33, H.&T.C. Sur. ..... Drlg. 4,035 ft.
Lewis & Slagel's No. 1 Johnson, 330 ft. from N and 1,650 ft. from W, Sec. 6, Blk. 56, Twp. 1, T.&P. Sur. ..... Drlg. 950 ft.
Lockhart & Co.'s No. 3 Bowen & Wells, 330 ft. from NE and SE of Sec. 92, Blk. 1, W.&N.W. Sur. ..... S.D. 3,385 ft.
Miller et al's No. 1 Ferguson, 990 ft. from N and E of Sec. 44, Blk. 29 ..... Spudded.
Tennant et al's No. 1 Martin, 990 ft. from NW and SW, Sec. 66, Blk. 1, W.&N.W. Sur. ..... S.D. 4,380 ft.; to run csg.
Thomas' No. 1 Wheat, 2,310 ft. from NW, 990 ft. from NE, Sec. 83, Blk. 1, W.&N.W. Sur. ..... Location.

MENARD COUNTY

Priest's No. 1 Sorrel, 1,000 ft. from E and 200 ft. from S cor., Sec. 132, E.L.R.R. Sur. ..... S.D. 2,860 ft.

PECOS COUNTY

Anderson's No. 1 Lee Fever, 330 ft. from N and W of Sec. 78, Blk. 8, H.&G.N. Sur. ..... S.D. 2,037 ft.
Black et al's No. 1 Pecos Valley, 1,037 ft. from SE, 433 ft. from SW, Sec. 36, Blk. 3, H.&T.C. Sur. ..... S.D. 1,040 ft.
Cardinal Oil Co.'s No. 1 J. H. Tippett ("J"), 1,980 ft. from the S line and 990 ft. from the W line of Sec. 2, D. F. Robertson Sur. ..... S.D. 675 ft.; plugged back to 600 ft.
Corvette Oil Corp.'s No. 8 H. Monroe, 1,040 ft. from E line and 150 ft. from N line of Sec. 39, G.C.&S.F. Sur., Blk. 194 ..... Location.
Culberson Bros.' No. 4 Tippett, 150 ft. from N and 1,325 ft. from W of SE, Sec. 40, Blk. 194, G.C.&S.F. Sur. ..... S.D. 520 ft.
Hampton et al's No. 1 Byrne, 1,980 ft. from NW and 1,500 ft. from NE, Sec. 54, Blk. 10, H.&G.N. Sur. ..... Drlg. 1,180 ft.
Dittman's No. 1 Sanford, 330 ft. from NW and 1,650 ft. from NE of Sec. 55, Blk. 10, H.&G.N. Sur. ..... S.D. 1,454 ft.

PRESIDIO COUNTY

Sadler et al's No. 1 Bledsoe, 2,640 ft. from N and W Sec. 15, Blk. 354, G.C.&S.F. Sur. ..... Rig.

REAGAN COUNTY

Big Lake Oil Co.'s No. 6-C University, 1,370 ft. fro mS and 1,000 ft. from E, Sec. 12, Blk. 2 ..... Drlg. 6,380 ft.

REEVES COUNTY

Cunningham et al's No. 1 Wright, 1,330 ft. from S and W, Sec. 58, Cassel's Sur. ..... S.D. 75 ft.
F. McDorman et al's No. 1 Ray Roberts et al, 2,310 ft. from S and E lines of Sec. 22, Blk. 59, P.S.L. Sur. ..... S.D. 105 ft.
James & Milton's No. 1 Patterson, 330 ft. from N and W of Sec. 21, Blk. 72 ..... Drlg. 3,840 ft.
Lee O. White et al's No. 1 Hershersor, 330 ft. from N and W lines of Sec. 5, Blk. 51, Twp. 10, T.&P. Sur. ..... S.D. 5,044 ft.

RUNNELS COUNTY

Blue Bonnett Oil Co.'s No. 1 McMillan, 1,368 ft. from N and 660 ft. from W, Sec. 22, N. Travis Sur. ..... Rigged up.
Dutton et al's No. 1 Dean, 5,475 ft. from NE and 1,048 ft. from NW in J. Heil Sur. No. 519 ..... S.O. 3,417-20 ft.; S.D. 3,600 ft.

SCHLEICHER COUNTY

Eastland Oil Co.'s No. 1 Joe Tisdale, C Sec. 29, Blk. M, G.H.&S.A. Sur. ..... Drlg. 5,285 ft.
Wesner et al's No. 1 Nicks, 2,310 ft. from N and 2,302 ft. from E of Sec. 77, Blk. LL, T.C. Sur. ..... S.D. 5,580 ft.; fishing.
George Wilson's No. 1 Page, Sec. 40, Blk. L, 1,290 ft. from N, 1,570 ft. from W, G.H.&S.A. Sur. ..... S.D. 5,053 ft.

SCURRY COUNTY

G. E. Dickman et al's No. 1 F. C. Davis, 1,000 ft. N and 1,770 ft. W of SE cor. of Sec. 275, Blk. 2, H.&T.C. Suh. ..... S.D. 5,050 ft.
Scurry County Oil Exchange's No. 1 Earnest, 2,310 ft. from N and W, Sec. 68, Blk. 3, H.&G.N. Sur. ..... Spudded and S.D.
Seifert & Dibble's No. 1 T. M. Blackburn, 2,310 ft. from N and 2,310 ft. from W line of Sec. 153, Blk. 97, H.&T.C. Sur. ..... S.D. 4,310 ft.

TAYLOR COUNTY

Eastland Oil Co.'s No. 1 King, 150 ft. from S and E, Lot 27, Willis Sur. ..... Location.

TERRELL COUNTY

Big Bend Oil Co.'s No. 1 Bassett, C NW Sec. 155, Blk. D, M.-K.-T. Sur. ..... S.D. 2,269 ft.
Keck Pecos Trust Co.'s No. 1 Hamilton, C Sec. 6, Georgetown Ry. Sur. ..... S.D. 3,150 ft.; moved off tools.
Miller Bros.' No. 1 Allison & Burke, C NW Sec. 10, Blk. 176, T.&P. Sur. ..... S.D. 120 ft.
Mid-Kansas Oil & Gas Co.'s No. 1 Goode, 2,152 ft. from E and 330 ft. from S, Sec. 26, Blk. 161, G.C.&S.F. Sur. ..... S.D. 6,120 ft.
Jones et al's No. 1 Pankenham, C SE NW Sec. 43, Blk. B-2, C.C.S.D.&R.G.N.G. Sur. ..... S.D. 2,545 ft.
Sides et al's No. 1 Phelps, 2,157 ft. from N and 2,482 ft. from W, Sec. 5, G. W. Hurley Sur. ..... S.D. 1,000 ft.

TOM GREEN COUNTY

Andrews' No. 1 Pugh, 250 ft. from N and 5,184 ft. from E, James Eldridge Sur. No. 73 ..... S.D. 453 ft.
Belding & Dutton's No. 1 Norsworthy, 1,640 ft. from S and 587 ft. from E of John McNeese Sur. ..... S.D. 760 ft.; S.O. and gas 725 ft.
Mintex Oil Co.'s No. 1 Campbell Est., 446 ft. from S and 630 ft. from W of Sec. 180, Dist. No. 11, S.P. Sur. ..... S.D. 1,994 ft.
Pratt & Hancock's No. 2 Lewis, 100 ft. N and 330 ft. E of most northerly SW cor. of Joshua S. Grant Sur. No. 2 ..... S.D. 200 ft.

UPTON COUNTY

Farley et al's No. 1-B Lone, 2,310 ft. from N and E, Sec. 36, Blk. 1, M.-K.-T. Sur. ..... Drlg. 405 ft.

VAL VERDE COUNTY

Couch et al's No. 1 J. P. Yoas, 1,300 ft. from the N line and E line of Sec. 31, Blk. 1, I.&G.N. Sur. ..... S. D. 220 ft.
Independent Operators' No. 1 Whitehead, SE SE Sec. 10, Blk. 4, I.&G.N. Sur., elev. 1,175 ft. ..... S.D. 5,360 ft.
O. O. Owens' No. 1 Mills, Sec. 128, Blk. 1, I.&G.N. Sur., elev 2,130 ft. ..... S.D. 6,780 ft.

WARD COUNTY

Abell Bros.' No. 1 Sloan, 330 ft. from NW and NE, Sec. 24, Blk. 5, H.&T.C. Sur. ..... T.D. 2,430 ft.
Abell Bros. et al's No. 1 Smith, 330 ft. from NE and NW, Sec. 4, Blk. 34, H.&T.C. Sur. ..... Moving in material.
Bradford & Bentley's No. 1 B. Carson, 1,650 ft. from the NE line and 990 ft. from the SE line of Sec. 26, H.&T.C. Sur., Blk. 5 ..... Rigging up.
Buck Sturm et al's No. 2 R. H. Gill, 2,310 ft. from SW line and 330 ft. from SE line, Sec. 25, Blk. B-29, P.S.L. Sur. ..... Swabbing and cleaning out.; T.D. 2,485 ft.
Eastland Oil Co.'s No. 1 Weiss, 2,365 ft. from SE and SW, Sec. 4, Blk. 34, H.&T.C. Sur. ..... Location.
Eppenauer's No. 1 Purcell, 365 ft. from SW and 1,650 ft. from SE of Sec. 17, Blk. 14, H.&T.C. Sur. ..... S.D. 2,740 ft.; estm. 25-bbl. well.
Eppenauer Drlg. Co.'s No. 1 Townsend-Moore, 990 ft. from SE and 330 ft. from SW, Sec. 17, Blk. 34, H.&T.C. Sur. ..... Spudded and S.D.
H. V. Greer's No. 1 Carr, 150 ft. from NW and 510 ft. from SW, Sec. 12, Blk. 5, H.&T.C. Sur. ..... S.D. 2,050 ft.
Gulf Prod. Co.'s No. 10 Hutchings, 330 ft. from N and W of 5,370 acres, Sec. 5, Blk. F, G.M.M.B.&A. Sur. ..... Drlg. 2,510 ft.
Gulf Prod. Co.'s No. 21 O'Brien, 2,557 ft. from N, 330 ft. from E of Sec. 16, Blk. F ..... Rigging up.
Massie et al's No. 1 Stewart, 330 ft. from SW and SE, Sec. 12, Blk. 14, H.&T.C. Cur. ..... Rigging up spudder.
Moran & Burkhart's No. 2 J. T. Sweatt et al, 3,810 ft. from SW, Sec. 1, J. Howe Sur. ..... S.D. 821 ft.
Moran & Miles' No. 1 Boogher, 3,603 ft. from NE and 1,303 ft. from SE, Sec. 11, Blk. 5, H.&T.C. Sur. ..... S.D. 1,970 ft.
R. F. Owen's No. 1 Lee, 1,344 ft. from NW and 4,532 ft. from SW, Sec. 1, J. Howe Sur. ..... T.D. 830 ft.; underreaming 10-in. csg.
Plains Prod. Co.' and Simms Oil Co.'s No. 1 Benton Land Co., 440 ft. from the SE and 440 ft. from SW lines of Sec. 26, W.&N.W.R.R. Sur., Blk. 1 ..... Drlg. 440 ft.
Rector Oil Co.'s No. 1 Smith, 1,320 ft. from N and E, Sec. 22, Blk. A, G.M.M.B.&A. Sur. ..... S.D. 3,602 ft.
Richardson et al's No. 8 O'Brien, 1,372 ft. from N, 330 ft. from W, Sec. 5, Blk. F ..... Location.
Richardson et al's No. 7 O'Brien, 1,900 ft. from N and 330 ft. from W Sec. 5, Blk. F ..... Drlg. 1,365 ft.
Richardson et al's No. 8 O'Brien et al, 1,372 ft. from N and 330 ft. from W of Sec. 5, Blk. F, G.M.M.B.&A. Sur. ..... Rigging up.
Rixford et al's No. 1 Green, 330 ft. from NW and SW Sec. 4, Blk. 34, H.&T.C. Sur. ..... Drlg. 500 ft.
Sudderth & Carey's No. 1 J. H. Boogher et al, 150 ft. from SW and SE lines of Lot 24, Sec. 11, Blk. 5, H.&T.C. Sur. ..... S.D. 290 ft.
Stanolind Oil & Gas Co.'s No. 1 Cannon, 3,300 ft. from SE and 1,649 ft. from NE, Sec. 29, Blk. B-29 ..... Drlg. 2,595 ft.; made 2 small flows.
T. P. Coal & Oil Co.'s No. 2 James, 330 ft. from NW and NE Sec. 5, Blk. 34 ..... Rigging up.
White et al's No. 1 Burtner, 150 ft. from NE and 515 ft. from SE of Sec. 8, Blk. 32, H.&T.C. Sur. ..... S.D. 755 ft.

WINKLER COUNTY

Liner Drlg. Co.'s No. 1 Campbell, 350 ft. from N and E cor., Sec. 2, Blk. B-5 ..... S.D. 4,640 ft.
Sid Richardson's No. 1 S. M.Halley, 330 ft. from the S line and 1,650 ft. from the E line, Sec. 25, School Blk. B-12 ..... Est. making 1 bbl. oil per hour; T.D. 3,061 ft.; to plug.

CLASSIFIED WANTS

Read by Oil Men Everywhere

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The rates for Classified Advertisements are 35 cents a line for the first insertion and 25 cents a line for each additional inserton. Six words usually constitute a a line. The following table will enable you to figure the cost of your advertisement:

	1 time	2 times	3 times	4 times
3 lines	1.05	1.80	2.55	3.30
4 lines	1.40	2.40	3.40	4.40
5 lines	1.75	3.00	4.25	5.50
6 lines	2.10	3.60	5.10	6.60
7 lines	2.45	4.20	5.95	7.70
8 lines	2.80	4.80	6.80	8.80
9 lines	3.15	5.40	7.65	9.90
10 lines	3.50	6.00	8.50	11.00

Compute white space at the above rates.

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Mail your Classified Advertisement to

THE OIL AND GAS JOURNAL
Tulsa, Oklahoma

FOR SALE—EQUIPMENT

200 AMP. General Electric Arc Welder; portable; 220 V. 3 ph. 60 cy. Complete. Like new. $350. 7x6 Ingersoll-Rand Type ER-1 Air Compressor. Like new. $225. 8x6 Ingersoll-Rand Type ER-1 Air Compressor. Like new. $250. 36"x18' Fifield Screw Cutting Lathe. $650. Also large stock of lathes, shapers, pipe machines, bolt threaders, etc. Send for our list. Terms to suit.
CINCINNATI MACHINERY & SUPPLY CO.
26 West Second St., Cincinnati, Ohio.

FOR QUICK SALE—Very complete string, latest type, Rotary tools with 125 H.P. 250-pound WP Boilers, six-inch Steel Jack Posts, Drawworks, 27½-inch Rotary and large pumps, high pressure connections and fittings. Only drilled 4,000-foot well. Good as new. Located Pampa, Texas. Priced right. The Bridgeport Machine Company, Box 17, Wichita, Kansas.

EQUIPMENT WANTED

WANTED to buy a cheap 24" Drilling Bit, weight approx. 3,800 lbs., 4¼x6" Pin; also 20" Latch Casing Elevator, cheap. Address Box F-120, The Oil and Gas Journal, Tulsa, Okla.

OIL INDUSTRY PRINTING

OIL FIELD LEGAL BLANKS
Leases, assignments, releases, township plat books, well records, etc. Request on your letterhead gets free catalog. Olds Press, 215 East Third St., Tulsa, Okla.

FOR SALE

FUEL OIL, crude oil tank car lots, LUBRICATING OILS S.A.E. 60, in bbls. $.28 per gallon, shipped any point. East Texas Fuel Oil Co., 212 Forman Bldg., Longview, Texas.

RANCHES AND FARM LANDS

RANCH land in Texas and New Mexico, 40 acres to 400,000 acres, improved or unimproved, $2 per acre up; cash, terms or trade for business property, stocks or bonds. Amos Poe, Andrews Building, Dallas, Tex.

INCORPORATIONS

CHARTERS — Delaware best, quickest, cheapest, most liberal. Free forms. Colonial Charter Co., Wilmington, Del.

BUSINESS OPPORTUNITIES

$1,000.00 A MONTH
I have men right now making $1,000 a Month selling excellent close-in leases to good East Texas wildcat wells. I want a good man in every city. I furnish maps and data. Times were never better to reap quick oil money in East Texas. Prices right for you to make yours. Am Building up the largest oil lease sales force in America. Don't write unless you are a 100-point man.
W. J. DOBBS
915 Tower Petroleum Bldg., Dallas, Tex.

WITH $10,000 CAPITAL — Believe can make a profit of $100,000 in six months' time trading in commodities. Time is here now. Years of experience. GREGG SNYDER, 25 Broadway, New York.

OIL located before drilling. Geophysical method. Toggodometer Instrument; take pay in oil. No oil, no pay, except traveling and testing expenses. 95 per cent accuracy. O. P. Coffin, Caddo, Tex.

NOTICE TO DRILLERS OR INVESTORS
I own 1,000 acres within a mile of production in East Texas with good Geology reports. Will give liberal interest therein for drilling one well. Address Box F-110, The Oil and Gas Journal, Tulsa, Okla.

Oil Discovered in Brazil!!!

First Well 15,000 Bbls. Daily
Drilled in a Few Days Ago.

Rare opportunity to obtain leases, government concessions production, refining, marketing. Engineer 15 years resident in Brazil experienced in assembling oil leases in Brazil speaking language as native with influential political friends and extremely valuable information desires financial backing for big success. Am now in Tulsa. Let's Go!!! Address Box F-124, The Oil and Gas Journal, Tulsa, Okla.

WILL GIVE 1/10 interest in full mining claim—20 acres—for 12-inch hole 1,200 feet deep. Over $60,000 spent on this property—thousands in sight. C. J. Greene, Sells, Ark.

PATENT ATTORNEYS

REGISTERED PATENT ATTORNEYS
United States and Canada
Before disclosing your invention to anyone, send for blank form.
Evidence of Conception
Bulletin "How to Establish Your Rights" and complete information free.
LANCASTER, ALLWINE & ROMMEL
Suite 418-815, 15th St., N.W.,
Washington, D. C.

FOR SALE—EQUIPMENT

SITUATIONS WANTED

WANTED POSITION, Charge of purchases and stores dept. with oil or manufacturing firm. Capable handling both departments in one unit. Eighteen years' experience. Address Box E-982, The Oil and Gas Journal, Tulsa, Okla.

SUPERINTENDENT drilling and production, graduate engineer, 12 years experience charge operations Rocky Mt. and Mid-Continent areas, desires position assistant to manager or charge operations. Address Box F-121, The Oil and Gas Journal, Tulsa, Okla.

LAND AND LEASE MAN
College graduate, 8 years experience geological, land, drilling and production departments, 6 years checking and buying leases and producing properties. Address Box F-122, The Oil and Gas Journal, Tulsa, Okla.

PETROLEUM Engineer, conversant with modern refinery practices, capable designing Fractionating Equipment, Furnaces and Heat Exchangers as well as other refinery units. Several years charge Engineering Department Large Oil Company. Desire connection with progressive firm or company. Address Box F-125, The Oil and Gas Journal, Tulsa, Okla.

MONEY RAISING

JAMES E. MILLER CO. will co-operate with responsible firms or parties seeking aid in financing projects of higher order. 207½ East Third Street, Tulsa, Okla.

FINANCE YOUR OWN project with shares bonded. Quickest, most satisfactory known method of raising capital. Information free. Bankers Interstate Security, Electric Bldg., Denver, Colo.

JOHN MORRIS, 3608 WARREN ST., PHILADELPHIA, Pa., invites full facts first letter from capable parties planning negotiation of reasonable capital support for undertakings distinctly of higher order. Use registered mail, safeguard data.

DO YOU NEED MONEY for organizing or financing oil or mining deals? Write 2443 N. W. 12th, Oklahoma City.

MONEY RAISING
Inquiries solicited from corporations interested in raising capital through marketing corporate securities.
THE BROOKWORTH CO., INC.,
110 East 42d St., New York.

ROYALTIES—PRODUCTION

MONTHLY INCOME-PAYING Royalties under Oklahoma City and Seminole Wilcox Sand wells offered. W. E. Cook, 342 Court Arcade, Tulsa, Oklahoma.

FOR SALE—EQUIPMENT

USED PIPE

12,000′	2″ Plain End Pipe	.08 per ft.
20,000′	3″ OD Plain End Pipe	.10 per ft.
1,500′	3″ ID Screwed Pipe (threads and couplings)	.15 per ft.
10,000′	4″ OD Plain End Pipe	.17 per ft.
7,000′	5½″ OD Plain End Pipe	.25 per ft.
2,500′	6″ OD Plain End Pipe	.28 per ft.
10,000′	6⅝″ OD Plain End Pipe	.30 per ft.
9,000′	8⅝″ OD Plain End Pipe	.40 per ft.
2,000′	8″ ID Screwed Pipe (thread and couplings)	.40 per ft.
10,000′	12¾″ OD Plain End Pipe	.60 per ft.

All in good condition—Plain Ends rebeveled for welding.

Terms Cash. F.O.B. cars Seminole, Okla.

Subject to prior sale.

W. S. BABSON

Beacon Life Bldg. **Tulsa, Okla.**

Phone 5-3416

CLASSIFIED DISPLAY RATES

The rate for Classified Display Advertising set in similar style to this Ad or in two Column style is as follows for each insertion:

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One point borders and ten point capitals are allowed, larger type not accepted.

Changes in copy must be in our office 10 days in advance of publication date.

Mail your advertisement to the Largest Classified Section in the Oil Industry.

THE OIL AND GAS JOURNAL
TULSA OKLAHOMA

ROYALTIES PRODUCTION

8,000 ACRES in solid block in S.E. Texas. Will turn on drilling contract or as commercial lease. W. R. Miller, 1216 Hurley Ave., Fort Worth, Texas.

UNUSUAL OPPORTUNITIES FOR ROYALTY INVESTORS AND DISTRIBUTORS

THE MERCURY COMPANY
Philtower Building, Tulsa, Oklahoma

JAMES B. McANALLY

Speculative and Investment Royalties

Hunt Building, Tulsa, Okla.

Service to dealers, Oklahoma, Kansas and East Texas.

For INCOME AND SPECULATIVE Oil Royalties for Investment, write SPENCER ROYALTIES CO. Thompson Bldg., Tulsa, Okla.

ROYALTIES in the territory of coming big development in Kansas, Stafford, Barton, Ellsworth, Kingman and Stevens Counties, core drilled. Also producing royalties. Special service to brokers. Send for list. James R. Haynes, Grantville, Kans.

HIGH GRADE producing oil and gas royalties offered to dealers. Billie Smallwood, P. O. Box 2261, Tulsa, Okla.

ROYALTIES, Kansas, Texas, Okla., under wells, offsets. Big list, maps free. Harry Haynes, Grantville, Kans.

LEASES—PRODUCTION

TEXAS PANHANDLE Gas Production and Royalties is my Hobby—get my prices. Wire or write. E. B. Reeves, Box 13, Alanreed, Gray County, Texas.

PRODUCING Gas properties in Kentucky. Pipe line connections. Many inside drilling locations. Attractive proposition. Joel Bailey, 310 Mercantile Bldg., Evansville, Ind.

TECHNIQUE IN REID VAPOR PRESSURE TESTS

(Continued from Page 28)

chamber is exactly 4. The limits of 3.8 to 4.2 are allowed in the procedure but in order to place the ratio in the center of the tolerance all bombs are made exactly 4 to 1.

2. Each bomb passes a test for leaks at 100 pounds per square inch gauge pressure before leaving the factory. This insures against vapor and liquid leaks, also some imperceptible leaks which may later develop.

3. The one-fourth inch adapter for pressure gauge connection is attached permanently to the pressure gauge. In removing the gauge no pressure is brought to bear but a wrench of suitable size attached to a bench or other fixed position is applied to the hexagon shoulder of the one-fourth inch adapter and the gauge and adapter are removed as a unit.

4. Extreme care is used in determining whether gauges are accurate by the use of a mercury column for testing gauges for products not in excess of 30 pounds per square inch, absolute; for products over 30 pounds per square inch, absolute, a dead weight tester is used.

5. End of smooth jawed wrenches (not Trimo or Rigid) are used to tighten joints to prevent leaks, if it is not possible to do so by hand. This prevents injuring the bombs by wrench marks.

6. Extreme care is taken to see that the air chamber is thoroughly purged of any gasoline vapors that may remain from a previous test. This is accomplished by using hot water (90°-100° F.) from a faucet or the water from the 100° F. bath may be used if the water is siphoned from below the surface of the bath into the air bomb. Care must be taken to prevent any gasoline on the surface of the water from entering this chamber.

7. In carrying bombs to the loading rack, pressure storage tanks, or open storage tanks, it is more convenient to carry the air and gasoline chambers screwed together. Ordinarily, there are no provisions for purging the bombs at the source of the sample. It is necessary then to purge the liquid bombs, both standard and California type, with hot water (90°-100° F.) the same as the air bomb. The thorough rinsing with the product to be tested will work out all water. This is accomplished by inverting the California type gasoline chamber and allowing any small amount of water to drain out with the gasoline; the water from the standard type may be removed by several rinsings, if necessary.

8. The liquid chamber is filled completely to the top of the threaded neck and the air chamber should be attached immediately at the point of drawing the sample. If this is not done, evaporation and spilling of contents may occur which have been found to give lower results.

9. The one-fourth inch needle valve attached to the gasoline bomb of the California type with pressure on the upper side of the needle to avoid leaks should have a one-fourth inch cap or other stoppage screwed on immediately after drawing sample to insure further against leaking.

10. The temperature of the air bomb shall be taken with a thermometer (preferably cased to prevent breakage) inserted into the bomb to such a distance that it shall balance on the one-half inch nipple. This prevents the thermometer bulb from touching the sides of the bomb (which may give a false reading) and makes it possible to secure the true temperature of the air and water vapor.

11. A good joint seal other than shellac should be used on the threaded connections; key paste with a graphitic base and soap have both been found satisfactory.

12. The writer has found that several methods have been used in interpreting the procedure regarding the inverting and shaking vigorously in this position of the vapor pressure bomb. In one case the bomb was shaken horizontally; in another, it was merely inverted and the liquid allowed to run into the air chamber. In many cases the bomb was only shaken once or twice and certainly not "vigorously." In order to clarify this particular point the definite instructions in the procedure as interpreted by the Phillips Petroleum Co. states: "After five minutes the bomb is withdrawn from the bath, inverted (gauge down), shaken vigorously five times up and down and replaced in the bath."

13. With the proper care and attention to detail, duplicate results obtainable for Reid vapor pressure values should not differ from each other by more than 0.3 pound. The A.S.T.M. allows 0.5 pound tolerance but it is believed that 0.3 pound will call for more care and accuracy in conducting the test.

14. No attempt has been made here to quote or repeat the regulations governing the procedure for running this test. It is suggested to anyone interested that the foregoing inserts and changes be actually correlated in the procedure in their proper places, which will, in turn, make these inserts and changes of more value to the operator.

This definite information added and inserted in the official I.C.C. regulations for testing of gasoline by the Reid vapor pressure method tends to secure uniformity of results by offering more definite descriptions of various phases of the test and should result in a standardized technique of operation at all of the plants of the Phillips Petroleum Co.

REPORT OF OPERATIONS IN PERU AND COLOMBIA

CHATHAM, Ontario, Mar. 26.—Shipments of International Petroleum Co. from Colombia in January, 1932, aggregated 1,267,629 bbls., practically all to the United States. The company's 1931 operations in Colombia included completion of 44 wells with average initial production of 665 bbls., and a total for the year of 18,237,000 bbls.

In 1931 International Petroleum Co. completed 46 wells in Peru with initial production of 246 bbls. and a total output for the field of 7,675,000 bbls.

The average daily production in the Peruvian fields in February, 1932, fell to 20,043 bbls. as against 24,143 bbls. the previous month. In February, 1931, when there was a partial shut down of operations, the production averaged 16,641 bbls.

In Colombia, the average daily production in February, 1932, was 48,337 bbls. as against 49,485 bbls. in January and 59,908 bbls. in February, 1931.

Operations in the Peruvian Field in January showed only one new well completed with initial production of 37 bbls. The total crude production for the month was 748,425 bbls. These figures compare with seven completions and average initial production of 506 bbls. in January, 1931, when total production reached 778,440 bbls.

In the Colombian fields in January no completions were reported. The total crude production was 1,534,044 bbls. In January, 1931, there were six completions averaging 521 bbls. initial production and total production was 1,657,701 bbls.

CEMENTING OF WELLS TO SAVE WATER SUPPLY

AUSTIN, Tex., Mar. 28.—Unless all the 4,500 East Texas oil wells, and future wells, are cemented at the bottom of fresh water sands, the water supply of the 500-mile area threatens to be seven times as salty as seawater for the next 100 years or more. That is part of an official report being compiled by Lieut. Col. Will Beck, chief medical officer of the martial law zone, a physician and member of the state senate.

Doctor Beck's report asserts the necessity of cementing all the wells at the bottom of the Carrizzo sands. It also calls for cementing at the top of the fresh water sands to head off surface pollution.

Classified Wants

LEASES—PRODUCTION

OIL INFORMATION, service reports, Okla. City Field, showing Potentials, Allowables, Production and Pipe Line Runs. Price $5.00 per month. Clyde Kelly, 608 Perrine Bldg., Okla. City, Okla.

FOR SALE

Oil leases 88-form, in semi-wildcat, and proven territory, shallow field, Anderson County, Kansas. W. L. Morris Loan Co., Garnett, Kansas.

DESIRE connection with individual or company desirous of leasing drilling equipment, etc., capable of reaching a depth of not less than 5,000 feet. Please give details of your proposition, equipment, terms, etc. Have 400 acres in Sabine Parish, Louisiana, known as Zwolle Field. Production approximately 1,500 feet from land line. Address Box F-123, The Oil and Gas Journal, Tulsa, Okla.

FOR SALE—EQUIPMENT

LEASES—PRODUCTION

10 TO 250 ACRES, two miles from production, no dry holes between, near new well starting on Sun Company lease. E. Croft, Proctor, Texas.

OIL AND GAS locating. Methods used are reasonably accurate, drillers and clients are my references. Write E. Fackler, 4020 Walnut St., Kansas City, Mo.

OIL AND GAS LEASES free to responsible driller. New field, excellent showing. Write Chas. W. Carr, Milligan, Okaloosa County, Florida.

FOR SALE

Participating Interest in 200-acre oil and gas lease to be tested, Valencia County, New Mexico. Full particulars sent on request.

HOMER C. MILLS, INC.
1059 Subway Terminal Bldg.,
Los Angeles, California.

FOR SALE—EQUIPMENT

GASOLINE PLANT EQUIPMENT

2—72″x24′ Newton Absorbers, each	$600.00
1—30″x24′ Newton Absorber	$300.00
1—36″x24′ Newton Blending Evaporator	$300.00
1—36″x23′ Newton Blending Evaporator	$300.00
2—30″x24′ Newton Blending Evaporators, each	$250.00
2—30″x11′, 1,183 sq. ft. Newton Heat. Exc., each	$400.00
2—24″x11′, 702 sq. ft. Newton Heat Exc., each	$300.00
1—24″ Tulsa Type Absorber	$225.00
1—48″ Tulsa Type Absorber	$400.00
1—60″ Tulsa Type Absorber	$600.00
1—10′x40′ Gasoline Storage Tank	$550.00
2—8′x30′ Gasoline Storage Tanks, each	$300.00

Greater portion of above material is new and located in Tulsa.

OTHA H. GRIMES, 904 Kennedy Bldg., Tulsa, Okla.

Do Blind Ads Produce Results?

During the first six weeks of this year we carried 48 blind ads and to date have received 164 replies to forward to these advertisers.

These 48 ads occupied 119 lines of space at a total cost of $29.75. Is it possible to interest 164 prospective buyers for less money?

CLASSIFIED DEPARTMENT

The Oil and Gas Journal

TULSA, OKLA.

OKLAHOMA FIELDS

(Continued from Page 39)

field between the approximate depths of 5,300 to 5,500 feet.

The order states that all wells drilled in the Oklahoma City Field on or after April 10, before penetrating any of the oil producing sands below the base of Pennsylvania formation, shall set a string of casing, in addition to the surface casing at a depth of not less than 20 feet below the top of the Checkerboard lime or approximately 5,520 feet. In the event the Checkerboard lime has not been found at a depth of 5,520 feet and not below the base of the Oswego lime, casing shall be cemented either up to the surface or with at least 1,500 sacks of cement. Before bringing in any well drilled below the base of the Pennsylvania formation into production, a third string of casing, known as the flow string, shall be set as near the top of the producing horizon as practical. The casing shall be cemented with sufficient cement to reach the bottom of the second string if practical, or with at least 500 sacks of cement.

Crediting Allowables

The commission also issued an order upon the recommendation of the umpire pertaining to the methods of crediting the allowables in the field since November 1, 1931. The order states that all wells which were overproduced on the time basis on January 3, 1931, and had not made up such overproduction prior to November 1, 1931, are entitled to and shall be credited against the time not made up on that date with that overproduction of time for each day since that date, equal to the proportion the full market demand for oil that day bore to the potential of all wells in the field, as found in the orders of the commission fixing allowables from time to time. The allowable percentages during that time were: November 1, 1931, to January 1, 1932, 6 per cent; January 1 to 10, 4.8 per cent; January 10 to February 1, 3.5 per cent; February 1 to 16, 3 per cent; February 16 to March 1, 3 per cent, and thereafter for each day in each period at the percentage which the full market demand bears to the potential of the wells in the field, as found in the commission orders for the period.

In the Older Pools

In the old Quinn-Lyons Pool, in Okfuskee County, H. Stekoll's No. 25 Holmes, NE cor. SW SE, Section 16-11-11, found the Kingwood sand at 2,640-80 feet, where the hole filled several hundred feet with oil. The sand was given a shot and the crew was cleaning out. The well offsets a recent completion by the same operators which is making 75 bbls. a day on the pump.

An interesting test on the east side of Okmulgee County was nearing the Wilcox sand. It is J. H. Rebold Oil Co.'s No. 1 Rossiter, SE cor. SE NW NE, Section 1-12-13. The test was drilling at 2,500 feet and the Wilcox sand is expected around 2,700 feet. The test is located across 10 acres and southwest from the recently completed W. B. Pine's No. 1 Bradford which made 135 bbls. of oil a day from a total depth of 2,732 feet. The Pine well was originally completed as a gas well and drilled deeper from a total of 2,730 feet, where it started flowing at the rate of 7 bbls. an hour.

Eason Oil Co.'s No. 1 Huggins, SW cor. NW SE, Section 1-7-8, Hughes County, is a new location on a block of approximately 300 acres, northeast of the Holdenville Pool. The new test is approximately 1½ miles northeast from production.

Southern Oklahoma

The area southwest of Duncan in Stephens County is active. Derricks are being rebuilt after being blown down during the storm last week. Three new operations were drilling. Continental Oil Co.'s No. 2 Dare, NW cor. SW SE, Section 2-2s-8w, in the new area 5 miles south and 2 miles west of Duncan, is estimated at 50 bbls. a day on the pump from sand at 2,093-2,122 feet. This is a new producing formation.

J. D. Loofbourrow's No. 1 Dare, SW cor. NW SW SW, Section 1-2s-8w, was spudding. P. L. Gilbert and others' No. 1 Medley, SW cor. NE NE, Section 2-2s-8w, was spudding. G. L. Pace's No. 5 Gilworth, NW cor. SE NW, Section 2-2s-8w, was spudding.

Crane and Rankin's No. 1 Dare, SW cor. SW NW, Section 1-2s-8w, was rigging up rotary tools. G. L. Pace's No. 8 Houston, SE cor. NE SW, Section 2-2s-8w, is a rig moving in. Ed Chamberlain's No. 1 Parker, NE cor. SE, Section 11-2s-8w, is a location with the rig blown down.

Seminole Production

The production from the Greater Seminole area for the week ending March 25, was approximately 137,950 bbls. a day. The Seminole Field, which includes the first 12 pools listed below, averaged 99,895 bbls.:

Pool—	Bbls.
Little River	17,265
East Little River	3,435
Carr City	10,600
Maud	2,075
Mission	7,465
Bowlegs	12,365
Earlsboro	13,355
South Earlsboro	1,845
East Earlsboro	11,975
Seminole	15,275
East Seminole	1,110
Searight	3,130
Total	99,895
Allen	8,210
Asher	620
Wanette	4,510
Konawa	5,435
Sasakwa	1,880
St. Louis-Pearson	17,400
Total	137,950

Creek County

Elliott Brothers made location for No. 1-A Smith, C NE SE Section 18-19-9. Roy Dean and others' No. 1 Lashley, NW cor. Section 19-19-9, is an old well drilling deeper at 2,480 feet. Machine has been moved in for No. 1 Nance, NW cor. NE NE SW Section 30-19-9. H. E. Dowd and others' No. 1-B Weaver, SW cor. SE Section 16-17-11, is a machine. Wisconsin Oil & Gas Co.'s No. 1 Hillis, SW cor. NE NW Section 6-18-8, has been abandoned at 3,372 feet.

Okfuskee County

Ray Venson made location for No. 1 Escoe, NE cor. SW Section 6-13-11. Champlin Oil & Refining Co. has the rig up and the tools in at No. 2 Fulsom, NW cor. NE Section 18-12-11.

Lincoln County

Barnsdall Oil Co. and others' No. 1 Taylor, C SW NW Section 17-14-5, has been abandoned at total depth of 4,755 feet.

Tulsa County

French Development Co.'s No. 1 Jones, CNL SW NE Section 30-20-13, is spudding.

Oklahoma County

Indian Territory Illuminating Oil Co. and Phillips Petroleum Co.'s No. 2 M-K-T "B", CSL NE SE SE Section 34-12-3w, Oklahoma City Pool, is a cellar. T. B. Slick Estate and Southeast Improvement Co. made location for No. 13 Classen Edwards, CNL SE NE SW Section 3-11-3w. Location for No. 14 Classen-Edwards has been made in the NW cor. SW NE SW Section 3-11-3w. Location for No. 15 Classen-Edwards has been made in the CEL SE NW SW Section 3-11-3w. Location for No. 16 Classen-Edwards was made in the NE cor. SW SW Section 3-11-3w. No. 17 Classen-Edwards is a location in the NW cor. SE SW Section 3-11-3w. Location for No. 18 Classen-Edwards has been made in the SE cor. SW NE SW Section 3-11-3w. T. B. Slick Estate made location for No. 7 Terminal, SE cor. NW Section 3-11-3w. Phillips Petroleum Co. and others' No. 1 Bump, Block 19, Lot 36, Walnut Grove addition, CNL SE SW NE Section 3-11-3w, is a cellar. Phillips Petroluem Co. has the cellar dug for No. 1 Neff, Block 81, Lot 1, Shields South Oklahoma City addition, SE cor. NE SE SW Section 15-11-3w. No. 1 Head is a cellar, Block 15, Lot 29, Carney Heights addition, NW cor. SE SW NE Section 22-11-3w. Liquid Wealth Petroleum Co. has the cellar dug for No. 1 Guilds, Block 8, Lots 1 and 6, Spencer addition, SE cor. NW Section 22-11-3w. Grison Oil Co. made location for No. 1 Little, Block 1, Lot 1, Wilmont Place, NE cor. SW Section 22-11-3w. T. B. Slick Estate's No. 3 Terminal, SW cor. SE NW Section 3-11-3w, has been completed for 6,742 bbls. in four hours in Wilcox sand topped at 6,322 feet, total depth 6,484 feet. Spring Rose Drilling Co.'s No. 1 Henry, NE cor. NW NW Section 2-11-3w, topped Wilcox sand at 6,252 feet, drilled to total depth of 6,367 feet and made 100 bbls. gasoline on a quarter-inch choke.

Hughes County

Mid-Continent Petroleum Corp.'s No. 1 Bruner, NE cor. NW SE Section 9-7-8, has been completed for 575 bbls. in sand at 2,934-54 feet. No. 1 Tiger, SE cor. SW NE Section 9-7-8, has been developed from 2,966 feet to 2,977 feet and made 672 bbls.

Pottawatomie County

Mid-Continent Petroleum Corp.'s No. 3 Archer, SW cor. SE SE Section 14-6-3, made 305 bbls. in sand at 3,518-45 feet, total depth 3,552 feet.

Seminole County

Blackwell Oil & Gas Co.'s No. 1-A Jonah, SW cor. NE Section 15-9-7, is preparing to deepen from 3,520 feet. Empire Oil & Refining Co. has the rig on the ground for No. 5 Brown, SW cor. NE SE Section 3-8-5, Carr City Pool. No. 3 Fish "D", SE cor. Section 19-7-8, is a cellar. No. 2 Davis, SW cor. NE NE Section 30-7-8, is also a cellar. Amerada Petroleum Corp.'s No. 6 J. Tiger, NE cor. SW Section 3-8-5, has been completed for 105 bbls. from Wilcox sand at 4,144-70 feet and 90 bbls. from Hunton lime at 3,903-45 feet.

Greer County

H. A. French and others' No. 1 Murphy, SW cor. NW SE Section 23-7-21w, has been abandoned at 1,654 feet.

Stephens County

George Pace's No. 1 Dilley, NW cor. SW SW Section 22-2s-7w, is a rig. No. 4 Gilworth, NW cor. SE NW Section 2-2s-8w, is also a rig.

Marshall County

M. A. Neff and others' No. 3 Marshall, NE cor. SW Section 30-5s-6, is drilling at 200 feet.

Pontotoc County

Max Westheimer's No. 6 Milner, CSL SE SE Section 8-5-8, is drilling at 300 feet.

LeFlore County

Sooner Oil & Gas Co.'s No. 1 Rateree, NE cor. Section 26-7-26, is dry and abandoned at 1,585 feet.

Muskogee County

R. D. Valentine and others' No. 1 Newton, C SE SE Section 9-13-18, has been abandoned at 603 feet.

McIntosh County

Harmon Oil Co.'s No. 6 Porter, C SW Section 3-12-14, is spudding.

Okmulgee County

Jake Rutz Oil Co. moved a machine for No. 1-A Davis, NE cor. SE NW Section 1-12-13. J. L. Selby's No. 19 A. Flint, NW cor. NE Section 26-14-14, made 75 bbls. in sand at 935-63 feet. A. Thompson's No. 1 J. Daniel, NW cor. SW Section 6-12-14, is dry and abandoned at 2,805 feet. Penrod & Thompson's No. 1 S. Barnett, SE cor. Section 19-12-14, has been completed for 15,500,000 feet of gas in sand at 3,071-72 feet. Jordan and others' No. 3 Anderson, NW cor. NE NW NE Section 28-12-14, made 500,000 feet of gas from sand at 574-688 feet.

Wagoner County

C. A. Mechlin and others' No. 1-A Drew, CSL SW NW Section 30-18-15, is drilling at 715 feet. Sheridan Oil Co. and others' No. 1 M. Drew, SW cor. NW NE Section 26-18-15, is dry and abandoned at 1,100 feet. J. H. Striker and others' No. 4 Woody, SW cor. NE SW Section 29-18-16, is dry and abandoned at 852 feet.

GAS SERVICE DISCONTINUED

CHATHAM, Ontario, Mar. 26.—The Alberta Public Utilities Commission has approved the discontinuance by Northwestern Utilities, Ltd., of its natural gas service to the Fraser Flats area of Edmonton, effective March 18, owing to danger from subsidence due to old coal-mining operations.

Important Tests in Tioga County Give No Promise of Gas

By Special Correspondent

WELLSBORO, Pa., Mar. 26.—The keen interest which Tioga County natural gas men have taken in the three wells on the Wellsboro anticline is decidedly on the wane, with the Allegany Gas Co.'s Davey well, in Richmond Township drilling at about 5,400 feet in lime well below the Oriskany sand and the Wells Corp.'s county farm well, Charleston Township, down to 5,569 feet, nearly through the sand and so far dry. The third test is on the Ida Wheeler, in Delmar Township, where the Lycoming Gas Co. is drilling through cement, placed at 5,100 feet. The total depth of the hole is 5,528 feet, right on top of the sand. There has been no show of gas in this well although the officials of the company are reasonably sure that the sand has been penetrated a foot or more. The depth today is around 5,200 feet.

The Allegany Gas Co. plans at this time to drill their well to the salt, in order to prove the Oriskany structure. It is understood that the county farm well will be shut down and abandoned when operators have gone through the Oriskany sand.

The North Branch Development Co. is down to more than 1,870 feet in their Colegrove well, Lawrence Township, and are moving on the Murray, Lawrence Township.

The Penn United Gas Co. is drilling at more than 1,500 feet on both their Fletcher operation in Lawrence Township and their No. 2 Ida Russell well, Farmington Township.

Two new locations were reported during the week, both in Hebron Township, Potter County, one by Keefer and others on the E. N. Clair property, and the other by Schrack and others on the Tassel.

ROCKY MOUNTAIN AREA

(Continued from Page 46)

drilled to 5,958 feet without any particular change taking place, when the underreamer was lost in the hole and a fishing job is in progress. It is down to a 3-inch bit inside the 4¾-inch.

Adams County

Hills Dome Lease Development's No. 1 Hills, SE cor. Section 27-3s-64, near Watkins, is drilling below 3,800 feet in black shale. The 8⅝-inch is being carried.

Lincoln County

Eastern Colorado Oil Co.'s No. 1 State, SE cor. NW Section 36-14s-57, near Hugo, is bottomed at 3,425 feet and fishing for bit. This hole is showing sufficient gas through cavings to burn over the top and it generally is agreed it is less than 100 feet off the Dakota.

Jefferson County

Ruby Hill Oil & Gas Co.'s No. 1 Braden, SE cor. Section 24-4s-69, near Denver, cemented cave at 4,275 feet and is waiting.

Rio Blanco County

California Co.'s No. 1 California-Raven, NW SE Section 30-2n-102, Rangely Dome, is drilling at 3,969 feet. While no information is being given out as to formations cut, it probably is close to the Sundance, based on the log of Tide Water-Associated Oil Co.'s deep test. California Co.'s objective is the Weber, or Tensleep, of Pennsylvanian age.

La Plata County

McGarr Petroleum Corp.'s No. 1 Sanchez, NE SE NE Section 27-33-12w, Red Mesa district, which was completed last year at 3,320 feet in the McElmo, has not yet been put on regular production pending the finishing of a topping plant which is now in its final stage of construction. The well is estimated at 50 bbls. per day from sand at 3,313-20 feet. Same firm's No. 1 Pinon Mesa, NE cor. Section 34-33-12, is a rig.

Yuma County

Ira L. Keith of Denver has obtained 25-year gas franchises from the towns of Yuma, Wray and Eckley under contracts which call for supplying gas within 18

months, the gas to be developed in Yuma County if possible. Nine months is given for the developing of a local supply. If no gas is found in the county, then it may be brought in. Some gas was brought in at around 1,400 to 1,600 feet in Section 14-2s-43 in 1923 by the Midfields Oil Co., which drilled several wells. In 1925 Keith & Walker drilled to 940 feet in Section 5-1n-43. The Phillips Petroleum Co. and the Continental Oil Co. have both drilled tests.

WYOMING

Weston County

Tug Oil Co.'s No. 1, NW cor. SW Section 15-46-64, cemented a cave at 2,700 feet. Egaso Operating Co.'s No. 15, SE cor. NE Section 17-46-63, is fishing below 300 feet. The General Oil Co. of Rapid City, S. Dak., has acquired 80 acres in the NW Section 15-46-64, offsetting Riggs Oil Co.'s No. 1 in the SE NE Section 16, and plans to drill when spring opens.

Park County

There are no active drilling wells in Park County at this time, but there is a possibility Continental Oil Co. may drill an offset to Midwest Refining Co.'s No. 4 Rosenberg, NE NW NE Section 26-58-98, on the Frannie Dome, which was completed recently as a producer. The Continental holds a Northern Pacific lease and operates the properties of Frannie Oil Co.

Natrona County

Jarvis & McDonald's No. 1 Government, SE cor. Section 31-30-81, Spindletop Dome, has not yet resumed after spudding, due to bad roads. Western Producers, Inc.'s No. 1 Consolidated Royalty, SW SW Section 27-40-79, Salt Creek, is drilling at 1,000 feet deep with the shale at 1,900 feet as the objective. The Lakota Oil & Gas Co. has given notice that it expects to resume operations in the North Casper Creek Field on April 1. It proposes to put the wells on production and drill three more wells. Rig has been up for about a year for No. 5, NW cor. SE Section 1-36-82.

Fremont County

The Texas Company is drilling the first of a series of water wells on the Alkali Butte Dome to build up a water supply for a rotary operation in the event it decides to drill another test this spring. Heretofore the tests have been drilled with cable tools and serious difficulties prevented their completion. Its No. 1 State, SW SW Section 36-34-95, which was drilled to 4,485 feet last year, recently was plugged back to the Dakota and completed as a gas well. When that horizon was originally drilled it made 12,500,000 feet of gas and from 20 to 25 bbls. per day of oil from sand at 4,380-93 feet. Location for the rotary test has not yet been made.

Sublet County

The Calmonica Petroleum Corp. recently received authority from the Secretary of the Interior to put on production its well drilled in the NE Section 17-27-113, La Barge district, a year ago, and to put down another well. This well, which opened up some new territory, made 125 bbls. in 24 hours before being shut in from sand at 2,040-2,196 feet.

MONTANA

Carbon County

Ohio Oil Co.'s No. 1 Kuchinski, NW SE NE Section 15-7s-22, Golden Dome, is drilling at 4,911 feet.

Ohio Oil Co.'s No. 1 Caldwell, near east line Section 12-7s-22, Dry Creek, is building rig, and its No. 2 William Robbinson, C SE SE Section 3-7s-21, cemented the 12½-inch at 860 feet. Ohio's No. 2 Montana Industrial, C NW SE Section 11-7s-21, is drilling at 3,810 feet.

Carbon Oil & Gas Co.'s No. 1 McMinn, NW SW SW Section 7-7s-22, Dry Creek, is drilling at 2,600 feet.

Jack Creek Oil Co.'s No. 1, NE SE Section 15-7s-23, Jack Creek district, lost its hole at 1,330 feet and will skid rig.

Liberty County

California Co.'s No. 1 Ross, NE SE NE Section 3-33-6e, Utopia district, is drilling at 2,955 feet.

People's Oil & Gas Co.'s No. 1 First National Bank, C SE NW Section 17-36-6e, Bear's Den, is resuming. It is underreaming 8¾-inch at 1,900 feet to set at 1,975 feet to shut off water in the Colorado shale at 1,965 feet.

Northland Oil & Gas Co.'s No. 1 Yurman, C SE SW Section 32-33-5e, Liberty district, is drilling at 3,850 feet.

Glacier County

R. C. Tarrant is reported to have taken over Browning Development Co.'s No. 1 Reickoff, SE SW NE Section 3-34-6w, southwest of Cut Bank. Rig was erected last fall preparatory to drilling this spring.

J. T. Finn's No. 1 McLellan, NW cor. SE Section 12-34-6w, is a location.

Golden Valley County

Golden Valley Oil Co.'s No. 1, SW SE Section 26-6n-22, Belmont district, is drilling at 2,970 feet.

Pipe Line Runs

Average daily pipe line runs for the week ended March 26:

	Bbls.
WYOMING	
Salt Creek	23,780
Badger Basin	50
Big Muddy	1,580
Byron-Garland	600
Dallas-Derby	380
Dutton Creek	70
Elk Basin	640
Ferris	30
Frannie	2,240
Grass Creek	2,120
Hamilton Dome	710
Hudson	460
LaBarge	880
Lance Creek	100
Lost Soldier	2,510
Midway	90
Oregon Basin	630
Osage	1,100
Pilot Butte	30
Rock River	1,710
Poison Spider	30
Teapot	20
Total Wyoming	39,760
MONTANA	
Buckley-Border	490
Cat Creek	870
Dry Creek	470
Kevin-Sunburst	3,430
Lake Basin	60
Pondera	990
Total Montana	6,310
COLORADO	
Florence	300
Fort Collins	900
Iles	810
Moffat	730
Orchard	430
Rangely	90
Tow Creek	290
Total Colorado	3,550
NEW MEXICO	
Rattlesnake	725
Hogback	380
Table Mesa	75
Artesia	495
Cap Rock	167
Hobbs	31,310
Jal	912
Lea City	2,020
Eunice	448
Texas Pacific	196
Total New Mexico	36,728
Total Rocky Mountain area	86,348
Total previous week	81,587
Difference	4,761

CHAMPLIN CASE NOW BEFORE SUPREME COURT

(Continued from Page 24)

the total market demand of the State; while the Seminole Field, with 20 per cent of the total potential production of the State, was allowed to produce 37.2 per cent of the market demand of the State."

Mr. Glasser cited the disapproval by the attorney general, William D. Mitchell, of the plan proposed by oil operators for limiting production in all of the oil states and charged that the arrangements have nevertheless been carried out.

"We concede the right of the State," Mr. Glasser said, "to prohibit waste." But he claimed that no order pertaining to the prevention of waste of oil had been issued. "If they would make each well, under the gas-oil ratio plan, the arbiter of its own production, we would have no need of private arrangements of umpires paid by private operators, of military rule, and of soldiers in the oil fields in time of peace."

The Champlin company, he said, is engaged not only in producing oil, but in transporting, refining and selling the oil. "We are engaged in a life and death struggle," its counsel stated, pointing out that it was not permitted to supply itself from its own wells the oil needed properly to operate its refineries.

The purpose of the statute, he concluded, "is not the pretended purpose of conservation; the purpose is to fix the price of oil to the American public."

Mr. German's Reply

In reply to contentions of opposing counsel, Mr. German for the State maintained that prohibition of waste was the only purpose of the statute and that it had been enforced according to its design. In response to a question by Mr. Justice Brandeis, Mr. German said the company is urging that production of oil from its wells can not be controlled according to "economic considerations" but declared that no such control was being exercised.

The alleging of discrimination between pools was also denied by the corporation commission's counsel. "There is no discrimination as between pools," he said. "There has never been an allocation of markets. The commission has not been under the domination of any committee of operators or a private umpire. The lower court found squarely against these contentions, and the company did not question its findings."

Mr. German explained the basis for the classification of the oil pools in the State. Each pool is treated as a unit for proration purposes, he said. "The commission determines the potential production of a pool, and the amount producable without waste. The ratio between these figures represents the prorated production."

The Seminole Field had its market outlet before the development of the Oklahoma City Field, he stated, but since it produced more oil than would be purchased, the commission determined the market demand, and "prorated down the allowable production of each well in the Seminole Field to the point where they can all participate in the market demand."

The same method has been since followed as to the Oklahoma City Field, Mr. German explained. He maintained that any differences between allowable production as between the two fields rested entirely on the fact of greater market demand for oil from the Seminole Field, and not because of any discrimination by the commission. "The commission has determined as to each field what the buyers will want; every time the demand has changed, the commission has changed the allowable production accordingly."

Mr. German then argued that this method of limiting the production of oil is within the police power of the State of Oklahoma. "The legislature of Oklahoma," he said, "possessed authority to determine and select the means to be adopted to accomplish conservation and the protection of the correlative rights of the landowners in the oil pools of the State."

In enlarging on his contention that the purpose of the Oklahoma law is to prevent waste and to protect correlative rights, Mr. German pointed out that correlative rights could not possibly be protected if any one producer was permitted to take out of a particular well a disproportionate part of the reservoir content.

On the other hand, he said, if each producer's potential output is restricted, then all producers are placed on an equal footing and there can be no charge of discrimination.

In reply to Justice Brandeis, Mr. German stated that there was no conflict over the legality of the procedure which is followed by the Oklahoma Commission in determining what is the market demand.

Counsel for the Oklahoma Commission then discussed the contention of the plaintiffs that an improper system for determining the oil output had been adopted.

"Of course a better system might have been adopted," he said, "but this court has always taken the attitude that the legislatures of the respective states have the right to exercise their discretion in determining what system should be accepted in a situation such as is presented in this case."

Mr. Miley's Argument

Mr. Miley discussed the action of the lower court in construing Sections 8 and 9 of the Oklahoma Act as criminal sections and in holding them invalid. He stated that the State admitted that Section 8 was a criminal statute, but that it felt that the court had erred in holding that Section 9 was such a statute.

As far as Section 8 is concerned, he said that, having found that no prosecution had been commenced against the plaintiff or any of its officers, agents or employes under this section, and the court not having found that such prosecution was threatened or contemplated, the lower court erred in construing the section and pronouncing judgment on its validity.

Mr. Miley said that, in his opinion, the lower court had erred in finding that the provisions of Section 9 of the act, calling for the appointment of a receiver for the operation only of producing wells and marketing the product thereof, of any person violating the provisions of the act, imposed a criminal penalty on violators of the law.

Mr. Beck's Contention

In concluding the argument for the Champlin company, Mr. Beck stated the issue in the case is whether a man, having invested his capital in a business, can be deprived by a state of his right to carry on that business. The Champlin company, he asserted, is being deprived of the use of its pipe lines, refineries and selling agencies because it is limited in the oil which it may produce from its wells.

"With all his facilities, Mr. Champlin can take no more oil from his wells," he said, "than the man who has nothing invested in pipe lines and refineries and who has created no market whatsoever. The man with a market for all the oil which he can produce from his wells is leveled down to the man without any genius for supplying himself with a market."

It was argued that if, by the mere fact of overproduction of oil, there is a right in all producers to a portion of the market, the measure of the right should be the capital invested in the business of supplying the market. Mr. Beck maintained that his client has the right to extract from his land all the natural flow of oil and gas, subject to the provision that it be done without waste.

The finding of the lower court that the Champlin company was not committing physical waste and has a market for all the oil it can produce was cited to the court.

"Why should it be penalized," Mr. Beck inquired, "for its efficiency in providing a market on the theory that those without a market and with no place to store oil would commit waste if permitted to operate their wells at full production?"

Charging that "the great oil operators are trying to drive Champlin out of the field," Mr. Beck declared that "the Oklahoma law as applied is not based on the correlative rights of co-owners in a common pool. It is a proration of markets between fields."

Concluding, he stated that the power of the State to prevent waste of oil or gas is limited to any uniform method. He maintained that the law and regulations being challenged are not uniformly applied and that under them the commission "arbitrarily allots a statewide market demand in percentages to different fields without any regard as to the ability of the individual producer to provide a market for his production."

TEXAS U. ROYALTIES

AUSTIN, Tex., Mar. 28.—University of Texas oil royalties passed the $16,000,000 mark during March, records of the state land office disclosed. Including the $101,138 royalties collected in March, on February production, the fund, as received by the land office amounted to $15,058,211. In addition, the State collected $1,000,000 for direct payment into the university permanent fund under agreed judgment in a former suit involving the amount of royalties from Reagan County production.

Manufacture of Natural Gasoline

Research Program of California Gasoline Association Outlined

The California Natural Gasoline Association's standardization committee has 10 problems under investigation and has issued bulletins on several investigations that have been completed recently. These subjects on which work is now being done include: (1) Deviation from Boyle's Law for high-pressure measurement of natural gas; (2) gas and gasoline sampling for fundamental analysis; (3) location of gas and gasoline sampling at plants; (4) revision of S-282, absolute pressure for natural gas measurements; (5) revision of TS-281, charcoal test; (6) standard test for both fat and lean absorption oils for plant control; (7) investigation of absorption oil losses and amount of absorption oil in natural gasoline; (8) collection of all tests relative to absorption plant work; (9) adoption of correct measurement practice; (10) development of the exchange of natural gasoline of different quality. The following problems have been completed, and are issued ready for sale in bulletin form: TS-281, procedure for the charcoal test for the determination of gasoline content of natural gas—distillation at 30 pounds pressure, condenser and receiver at 32° F. S-282, absolute pressure for natural gas measurement—the absolute pressure recommended by the metering committee of the California Natural Gasoline Association. TS-311, tentative standard method for analysis of natural gasoline by fractional distillation—recommended by the fundamental analysis committee of the California Natural Gasoline Association. TS-321, tentative standard method for analysis of natural gasoline by fractional distillation—recommended by the fundamental analysis committee of the California Natural Gasoline Association. Copies of these bulletins may be obtained from the office of the secretary, 314 Paramount Building, Los Angeles.

NATURAL GASOLINE IN PANHANDLE AREA

PAMPA, Tex., Mar. 28.—Stocks of natural gasoline increased during February within the Panhandle West Texas area and early in March were reported at 123,209 bbls. compared with 98,780 bbls. on February 1. Production in this district was reported as 463,056 bbls. for February while shipments totaled 429,627 bbls.

Gray and Hutchinson Counties having 19 and 18 plants, respectively, held 89,460 bbls. of the stocks and furnished 370,969 bbls. of the natural gasoline shipped from the area during the past month.

Out of the total production, Phillips Petroleum Co. contributed 220,869 bbls., nearly half.

On March 1, Gray County had 43,085 bbls., compared to 29,346 bbls. on February 1; Carson had 19,829 against 10,315; Hutchinson had 46,375 against 36,211, and Potter had 1,927 compared to 338. Moore County reduced its stocks from 11,047 bbls. to 9,955 bbls. and Wheeler County's stocks were 2,038 bbls. on March 1 against 2,523 bbls. on February 1.

LIQUEFIED GAS BY TANKER

NEW YORK, Mar. 28.—Anglo-Saxon Petroleum Co. has equipped its tanker "Agnita" for the transportation of liquefied petroleum gases as an experimental measure.

The first shipment was recently loaded on the "Agnita" by Shell Petroleum Corp. at Houston, the trial shipment being reported as 1,250 tons of liquefied propane and butane.

NATURAL GASOLINE PROGRAM FOR TULSA MEETING ISSUED

The Natural Gasoline Association of America will hold its next annual meeting in Tulsa May 17, 18 and 19. Papers dealing with the technical and economic developments within the industry have been prepared which deal directly with vital problems of immediate concern. Low prices and a more limited market has caused manufacturers of natural gasoline to exert extra efforts in the direction of improving their product from the standpoint of quality and to openly compete with the refiner in the sale of the latter's product if it becomes necessary to sell to the consumer directly.

It is believed that the same frank discussion will follow each paper as it is read and these discussions have featured the meeting of the association in the past. Economies which the industry needs to continue to effect which might otherwise tend to lessen the number of operators attending has prompted the program committee to prepare a list of subjects and speakers which should prove attractive.

The following tentative program has been arranged and while Ray Miller, secretary of the association, saw fit to withhold the name of the author of one paper, he says there will be no important changes in the tentative program.

Program for Eleventh Annual Meeting of Natural Gasoline Association of America

Tuesday, May 17

12 o'clock noon—Luncheon, furnished by Natural Gasoline Supply Men's Association.

Afternoon session—1:30 o'clock.

Address of welcome—Frank L. Chase, Lone Star Gasoline Co.

President's address—S. S. Smith, Shell Petroleum Corp.

Reports of active standing committees.

Paper, "Properties of Hydrocarbons at High Pressures as Applied to the Design of Absorbers, Strippers and Stabilizers"—Dr. G. G. Brown, University of Michigan.

"Refinery Vapor Recovery Systems, Including the Physical Properties and Utilization of Products"—Author to be selected.

8 p.m.—Stag smoker, furnished by Natural Gasoline Supply Men's Association.

Wednesday, May 18

Morning session—9:30 o'clock.

Broad Discussion of Economics of Natural Gasoline Industry—R. C. Alden, Phillips Petroleum Co. (It is planned to preprint Mr. Alden's paper and distribute it in advance at the registration desk. In this session Mr. Alden will briefly outline his paper in sections and lead the discussion on those sections.)

Afternoon session—2 o'clock.

"Natural Gasoline Markets and the New Grading System"—J. A. LaFortune, Warren Petroleum Co.

"The East Texas Field"—G. H. L. Kent, Humble Oil & Refining Co.

"Pipe Line Transportation of Natural Gasoline"—O. C. Field, O. C. Field Gasoline Corp.

9 p.m.—Dance, furnished by Natural Gasoline Supply Men's Association.

Thursday, May 19

Morning session—9:30 o'clock.

"Operating Economies Effected During 1931"—Fred Shryock, Shell Petroleum Corp.

"Specifications, Stenches and Markets for Liquefied Petroleum Gases"—G. G. Oberfell or T. W. Legatski, Phillips Petroleum Co.

"Carbon Dioxide"—H. Ross Campbell, Crosbie & Moran, Inc.

"Blending Natural Gasoline With Refinery Products"—J. L. Gallagher, Sinclair Oil & Gas Co.

12 o'clock noon—Luncheon, furnished by Natural Gasoline Supply Men's Association.

CARE TAKEN IN MAINTAINING AND OPERATING TANK CARS

By J. C. Carothers
Lone Star Gasoline Co.*

Tank cars are built, maintained and operated under the rules and regulations of the American Railway Association and the Interstate Commerce Commission, and are divided into 24 classes. Each class is built to handle some particular product or group of products, depending on the vapor pressure, etc.

Classes 4 and 104 are built along similar lines, and these two classes are used for the transportation of products known as natural gasoline. They are the same type of cars as classes 3 and 103 with one exception, classes 4 and 104 have an insulation around the tank equal in efficiency to 2 inches of 85 per cent carbonate of magnesium. The cost of these cars is around $2,300 each, so it is readily seen that a shipper with a fleet of 200 or 300 cars has quite an investment in railway equipment; therefore, it is to his interest to have the best of facilities for keeping the equipment in the best mechanical condition.

The American Railway Association has given the carriers authority to make such repairs on the shipper's cars as will place them in satisfactory condition to the handling line. Often this privilege is abused, resulting in excessive car repair bills. This is particularly true of some railroads.

The loading and plant forces should co-operate with the car departments to see that the cars are in the best mechanical condition before they are moved from the loading rack. At places where no carmen are employed, it should be the duty of the loading and plant forces to make such inspections and repairs as their knowledge and facilities will permit. Quite frequently a few cents' worth of lubricating oil, well placed in the journal box on the rising side of the journal, will save several dollars in repairs, as well as a delay to the load. Before loaded cars are sent on a trip, the packing in the journal boxes should be pushed well back in the box and brought up around the journal to a point half way up on it. If the packing is not thoroughly saturated with oil a small amount should be added. The inspector should know that all of the pins are in place in the brake gear, and that each one has a cotter key, well spread, through the hole provided for it. The loss of a hanger pin or brake pin will allow the brake gear to drop to the rail. Many serious wrecks have been caused from that particular defect.

Safety valves are another source of annoyance and expense to the shipper. It has been said that 90 per cent of the outage claims are caused from leaky safety valves. The Bureau of Explosives regulations tell us that the valves on a class 4 or 104 car must be set to operate at a pressure of 25 pounds per square inch, with a tolerance of plus or minus of 3 pounds. There are times when the spring that controls the pressure becomes rusted and weak, and allows the valve to open at a considerably lower pressure. Other mechanical defects would cause the same result.

Before unloading, it seems to be the general practice of the consignee to vent the cars by raising the valve from its seat. At some racks, the valve is held off its seat by the use of a file or some other hard object being placed between the valve and seat. This mars and cuts both the valve and seat, causing leaks which, if not detected and repaired before the next loaded movement will mean an outage claim. Some shippers are enclosing their valves in a housing to prevent venting the cars by the method just described.

In times past, one of the leading natural gasoline shippers removed, tested, and repaired their safety valves before each loaded movement; since there has been a decline in the price of their product, this practice has been discontinued. At the present time there is a great need for a "leak proof" and "fool proof" safety valve. Several of the so-called "leak proof" valves are now on the market. Some have been tried on Lone Star Gasoline Co.'s cars, but they were not successful, because they were constructed along the same lines as were the present standard safety valves and they were not "fool proof." Much has been written and said concerning the relation of the safety valve to outage, but it is the general opinion that there must be a change in the type of safety valves before they will be found guiltless of causing a majority of the outage claims.

As stated at the beginning of this paper, tank cars are operated under the regulations of the Interstate Commerce Commission and from time to time new regulations are issued, one of which is regulation 237, section 3, of its pamphlet, "Regulations for the Transportation of Explosives and Other Dangerous Articles by Freight and Express," which is as follows: "For tank cars used for the transportation of inflammable liquids with a flashpoint below 20° F. the mechanical arrangement for closing the manhole must be such as to make it practically impossible to remove the manhole cover while the interior of the car is subject to pressure, or vents that will be

(Continued on Page 153)

*Read before meeting of plant operators at Ranger, Tex.

CALIFORNIA OUTPUT OF LIQUEFIED GASES

SAN FRANCISCO, Calif., Mar. 26.—During January a daily average of 421 bbls., or a total of 13,050 bbls., of liquefied petroleum gases was produced in California and a daily average of 386 bbls., or a total of 11,955 bbls., was marketed according to the Bureau of Mines which includes these statistics for the first time in its monthly report. This production is included in the natural gasoline production figure in the consolidated tabulation but the sales are included in the sales of "Other Finished Products," being carried to this classification as a stock transfer.

Still-gas production during January amounted to 1,596,734,000 feet, equivalent on a b.t.u. basis to 507,087 bbls. of fuel oil. Still-gas production is not included in the consolidated tabulation.

GULF COAST REFINERY MARKETS MUCH FIRMER

HOUSTON, Tex., Mar. 28.—The announcement of crude advances in other areas to be effective April 1, together with the expected general increases on the Gulf Coast, has brought about a material strengthening of refinery markets in this district. This follows the better feeling which coastal refiners have experienced for several weeks as a result of the gradual improvement in the situation here.

In view of the higher crude prices announced, refiners are not anxious to sell except for immediate shipment or else for substantially higher prices than the present market. Inquiries for all material have increased materially as a result of buyers attempting to cover before the new crude schedules are put into effect.

Gasolines for domestic movement in bulk were quoted from 5 to 5¼ cents for 65 octane and above but material could be obtained for immediate shipment only. Gasolines, under 65 octane were available at 4¾ to 5 cents. Export material requiring no octane specifications could be bought over a range from 4¼ to 4⅝ cents.

The bullish market also was reflected in kerosenes which late in the week were held at a minimum of 4¼ cents for water-white material, both for domestic and export movement. Prime white material was quoted nominally from an eighth to a quarter cent under that figure but there is virtually none of this available.

No change has been indicated in the bunker market, which still is posted at 45 cents. However, bulk fuel has strengthened substantially to a minimum of 42 cents with some sellers asking 43 cents and better. An increase is expected in the bunker posting, as there is little fuel available. Gas oils are quoted from 2⅜ to 2⅝ cents but most of this product is being held for cracking stock and there is little trading.

Pale and red oils reflected further strength with most sources of supply fairly well taken care of. Buyers are finding increasing difficulty in meeting their needs and several sellers are behind, some 15 days. While there have been no general boosts in schedules of the various refiners, several grades of material are being held for higher prices.

REAGAN ROYALTY SUIT

AUSTIN, Tex., Mar. 24.—Trial of Atty. Gen. James V. Allred's suit for recovery of $575,000 additional royalties to the University of Texas on oil production in Reagan County has been postponed until April, because of illness of an attorney for the Continental Oil Co., one of the nine firms named in the suit. The case will be tried before District Judge J. D. Moore in ninety-eighth district court.

CORONADO CASE ARGUED

WASHINGTON, D. C., Mar. 28.—A test case involving right of the Federal Government to tax state-owned oil lands is before the U. S. Supreme Court for decision. Solicitor General Thomas D. Thacher asked the court to uphold the right of the Government to tax income of companies from oil they develop on such lands on a royalty basis. The case involved Coronado Oil & Gas Co., an Oklahoma concern.

Mr. Thacher estimates that loss of the right to tax the income from such sources may cost the Government as much as $12,000,000.

The lower court ruled that an oil company developing the oil resources was not subject to the federal income tax. The Government appealed.

DISCUSS RATABLE TAKINGS

AUSTIN, Tex., Mar. 28.—A conference of natural gas pipe line operators with officials of the State Oil and Gas Division has been called to discuss ratable takings.

FEDERAL TAX ON GASOLINE MAY BE ADDED BY CONGRESS

By Charles E. Kern
Washington Bureau, The Oil and Gas Journal

WASHINGTON, D. C., Mar. 28.—An excise tax on crude petroleum, fuel oil derived from petroleum, gas oil derived from petroleum and gasoline of 1 cent a gallon applying only with respect to the importation of these products, and a tax on lubricating oils of the grades designated (at the time of the enactment of this act) by the Society of Automotive Engineers viscosity Nos. 20 to 70, inclusive, of 4 cents a gallon, was made a part of the revenue bill in the House of Representatives by a vote of 190 to 97.

Now that the sales tax has been rejected by the committee of the whole of the House, Acting Chairman Crisp has announced the ways and means committee will consider taxes on gasoline, gas, automobiles, etc., as a means of raising revenue.

If the committee should decide in favor of a federal tax on all gasoline, which it formerly considered and rejected, there would have to be some revision of the wording of the paragraph placing a tax of 1 cent on imported gasoline in order to save any ambiguity in the construction of the law in which case there will be another vote on the subject of gasoline taxes while the bill is in committee of the whole.

It is estimated that a general gasoline tax would raise revenue to the extent of $160,000,000.

Estimates on the revenue that would be raised from a tax on the imported oil products provided for the bill vary from $5,000,000 suggested by the Treasury Department up to a vastly greater amount.

Significant Amendment

As accepted by the committee of the whole the tax on crude petroleum, fuel oil derived from petroleum, gas oil derived from petroleum and gasoline of 1 cent a gallon concluded with the following provision:

"But the tax on the articles described in this paragraph shall apply only with respect to the importation of such articles."

As in the report of the Ways and Means Committee when the revenue bill was submitted to the House this tax carried the following provision:

"But no article described in this paragraph shall be exempted upon importation from tax under this title as an article for further manufacture and no credit or refund of tax imposed upon the importation of any article described in this paragraph shall be allowed under Section 605(a)."

The change was in the form of an amendment presented by Chairman Crisp. Its effect is obvious.

After adopting the provision for an excise tax on oil in the committee of the whole the House itself agreed to the entire amendment as proposed by Acting Chairman Crisp of the Ways and Means Committee. Before consideration of the revenue bill is completed the measure may be referred back to the committee for a further report.

At that time or sooner it has been suggested that a tax on domestic consumption of gasoline be included as well as a federal tax on all gasoline.

Vote on Oil Sections

Even the vote on the oil sections may result in a different lineup when the bill comes before the House again.

In the first instance friends of the manufacturers' sales tax supported the oil excise tax with the idea that the oil men would reciprocate in upholding the bill as reported, especially in respect to the sales tax. This plan did not work out 100 per cent and oil votes were cast for a tax on imported coal at 10 cents per 100 pounds which antagonized the committee. Bedlam reigned but the coal tax brought votes for the oil tax.

With feeling brought out by the treatment the House has given the revenue bill reported by the committee there are numerous rumors concerning delay the measure may meet in its final enactment into law. There are predictions that it will not be finally enacted until after the nominating conventions have met and acted on their platforms. Others believe Congress will be able to place its final sanction on the measure early in June.

Oil and Coal

It now seems that oil and coal will stand or fall together. Many members feel uncertain about just what will happen as Acting Chairman Crisp openly charged in the House that there was a "trade" between the oil and coal men to get votes and the acting chairman showed great resentment over this condition. There were numerous charges that the bill had been turned into a tariff rather than a revenue measure.

As a side issue, Representative Marvin Jones (Dem.) of Texas sought to have exempted lubricating oils used in farm machinery. This was rejected 97 to 45. Representative Robert G. Simmons (Rep.) of Nebraska wanted all tariff taken off lubricating oils but his amendment was voted down without resort to a teller vote.

TEXAS PROFITED FROM MARTIAL LAW REGIME

AUSTIN, Tex., Mar. 28.—Gov. Ross S. Sterling has made the following statement in vindication of his use of martial law in controlling East Texas oil production:

"While martial law was declared primarily for the purpose of conserving the natural resources of the state and preventing insurrection and riot, the state has profited to the extent of more than $1,690,000 as the direct result of martial law in the East Texas oil field, according to figures submitted to me by State Auditor Moore Lynn. While the state has reaped this harvest, the landowners and royalty holders have profited to the extent of more than $12,000,000.

"The cost of martial law in East Texas for the period from August 17, 1931, to March 12, 1932, was only $240,000. The additional production taxes according to the state on account of the increased price of oil brought about by martial law during this period has amounted to $1,930,000, with the resulting profit to the state of $1,690,000.

"For the week ending August 21, 1931, the week martial law was declared, the average price of oil in Texas was 24 cents a barrel, with a production value of $2,380,000, yielding a production tax to the state of only $47,600. For the week ending March 12, 1932, the average market price of oil was 75 cents a barrel, and the estimated value of the production throughout the state was $4,394,000, which yielded a gross production tax to the state of $87,900.

"For the week ending August 21, 1931, the average price of oil was only 24 cents a barrel. The average price over the period from August 15, 1931, to March 12, 1932, has been 67 cents a barrel. The value of the oil actually produced during this period, on the basis of prices prevailing on August 15, 1931, would have been only $30,150,000, from which the state would have received a gross production tax of only $603,000. The actual value of the oil was $126,681,000, yielding a gross production tax of $2,533,000.

"As a result of martial law there was an average increase in price of 43 cents a barrel and an increase in production value of $96,531,000, from which the state received an increase in production tax of $1,930,000, this amount being $1,690,000 in excess of the cost of martial law.

"These figures demonstrate that as a direct result of martial law, the state has received in increased production taxes from the oil companies more than eight times what it cost to maintain martial law.

"The oil companies, as a direct result of martial law, have been made to pay to the landowners and royalty owners additional royalties to the extent of 50 times what it cost to maintain martial law.

"At the same time, the price of gasoline is now lower than it has been at any time in the last 16 years.

"By declaring martial law and forcing the people who buy and sell our oil to the markets of the world to pay its value, it has been possible to keep the state from going into a financial tailspin like the national government has done."

INSTITUTE DIRECTORS WILL MEET APRIL 5

Hope that there will be a full attendance of members is expressed in a call sent out by Amos L. Beaty, president of the American Petroleum Institute, to members of the board of directors to meet at institute headquarters, 250 Park Avenue, New York, Tuesday morning, April 5, at 10:30 o'clock. Mr. Beaty who has been in California will return shortly before the meeting.

THE OIL MAN'S CALENDAR

APRIL

2-10—Detroit, Mich., National Aircraft Show.

5—New York, American Trade Association Executives.

6-8—Birmingham, Ala., distribution committee, Technical Section, American Gas Association.

6-8—Excelsior Springs, Mo., Western Petroleum Refiners Association.

11-16—Boston, Mass., ninth annual convention, American Oil Burner Association.

14-15—Tyler, Tex., spring meeting, Southwestern District, A.P.I. Division of Production.

21-22—Cleveland, Ohio, semiannual meeting, National Petroleum Association.

22-24—Dallas, Tex., Petroleum Industry Electrical Association, Baker Hotel.

27-29—White Sulphur Springs, W. Va., National Pipe and Supplies Association, Greenbrier Hotel.

27-29—New York, annual meeting, American Welding Society.

MAY

4-6—Honolulu, Hawaii, National Foreign Trade Council.

9-11—Tulsa, Natural Gas Dept., American Gas Association.

13-14—Wellsboro, Pa., A.P.I. Production Division, Eastern district, Penn-Wells Hotel.

17-19—Tulsa, Natural Gasoline Association of America, Mayo Hotel.

9-13—Atlantic City, N. J., National Fire Protection Association.

JUNE

1-3—Tulsa, mid-year divisional meetings, American Petroleum Institute, Mayo Hotel.

6-9—Detroit, Mich., National Association of Purchasing Agents.

20-24—Atlantic City, N. J., American Society for Testing Materials.

SEPTEMBER

14-16—Atlantic City, N. J., annual meeting, National Petroleum Association.

15-17—Atlantic City, N. J., American Trade Association Executives.

22-23—Chicago, National Association of Motor Bus Operators.

NOVEMBER

10-12—Atlanta, Ga., Southeastern Economic Conference.

15-17—Houston, Tex., thirteenth annual meeting, American Petroleum Institute.

REFINERY AND CRUDE PRICES

Quotations on refined products are for interstate or export movement unless otherwise noted.

GASOLINES

	Mar. 29		Mar. 22	
OKLAHOMA (Group 3)—				
*U. S. Motor	.03⅞	.04¼	.03¾	.03⅝
60-62 400	.04	.04¼	.03⅝	.03¾
64-66 390	.04½	.04¼	.03¾	.03⅞
64-66 375	.04¼	.04⅜	.03⅞	.04
68-70 350	.04⅜	.04½	.04	.04¼
NORTH TEXAS—				
*U. S. Motor	.03¾	.04	.03⅜	.03½
60-62 400	.03⅞	.04	.03⅝	
64-66 390	.04	.04⅛	.03¾	.03⅞
64-66 375	.04¼	.04¼	.03⅞	.04
64-66 360	.04¼		.04	.04⅛
‡NORTH LOUISIANA—				
*U. S. Motor	.04½	.04¼	.03⅞	.04
60-62 400	.04¼		.04¼	
‡ARKANSAS—				
*U. S. Motor	.04	.04¼	.03⅞	.04
CHICAGO Based on Okla. (Group 3)—				
*U. S. Motor	.03¾	.04	.03½	.03¾
60-62 400	.03⅞	.04⅛	.03⅝	.03⅞
64-66 375	.03⅞	.04½	.04	.04¼
Aviation fighting grade	.05½		.05	.05¼
68-70 360	.04⅝	.04⅝	.04¼	.04⅝

Octane Ratings—Above quotations cover price ranges on gasoline in which no octane rating is given. In the case of the U. S. Motor and 60-62 400 endpoint grades where an octane rating of 57-65, inclusive, is guaranteed, prices are three-eighths cent per gallon higher than quotations shown in above tables; where an octane rating of better than 65 is guaranteed, the prices are five-eighths cent higher. In the case of the remaining grades, gasolines of 65 octane rating or higher are quoted one-fourth cent higher than the quotations shown in above tables. Unless otherwise provided by agreement of buyers and sellers, the Series 30 testing equipment of the Ethyl Gasoline Corp. is recognized as standard in determining octane ratings.

*Present distillation specifications on U. S. Motor gasoline are: 10 per cent evaporated, 167° F. maximum; 50 per cent, 284° F. maximum; 90 per cent, 392° F. maximum; residue not exceeding 2 per cent; maximum vapor pressure, 12 pounds. Additional specification on U. S. Motor gasoline available from bulletins of Bureau of Mines, Washington, D. C.

‡For Arkansas, Louisiana and Mississippi delivery.

PENNSYLVANIA (inland refineries)—				
U. S. Motor	.04¼	.04½	.04	
60-62 400	.04½	.04¾	.04¼	
64-66 375	.04¾	.05	.04¾	
68-70 350	.05¼	.05½	.05¼	

Octane Ratings—In the case of U. S. Motor and 60-62 400 endpoint grades, same price differentials based on octane ratings as shown in above tables for Oklahoma and other Mid-Continent areas.

CALIFORNIA (domestic movement only)—				
54-58 U. S. Motor	.04½	.05	.04½	.05
58-60 400	.05	.05½	.05	.05½
EAST COAST—				
U. S. Motor, below 65 octane:				
New York (Bayonne)	.05¾		.05½	.06
Boston	.06		.06	
Baltimore, Md.	.05¾		.06	
Charleston, S. C.	.05¾		.06	
U. S. Motor, 65 octane and above:				
New York (Bayonne)	.06	.06½	.06¼	.06½
Boston	.06¾		.06	.06¾
Baltimore, Md.	.06	.06¾	.06	.06¾
Charleston, S. C.	.06	.06½	.06½	

NAPHTHAS

	Mar. 29		Mar. 22	
OKLAHOMA (Group 3)—				
50-52 450 (blending)	.03⅝	.03¾	.03⅜	.03½
PENNSYLVANIA (inland refineries)—				
50-54 430-450 (blending)	.04	.04¼	.04	
ARKANSAS—				
48-50 450 (blending)	.04		.03¾	.04
CHICAGO Based on Okla. (Group 3)—				
50-52 450 (blending)	.03⅜	.03¾	.03¼	.03½
Cleaners' naphtha, 56-58 gr. 200 i.b.p.-320 e.p.	.06	.06¼	.05¾	.06
Lacquer diluent, 180 i.b.p.-250 e.p.	.09⅛	.09⅜	.09⅛	.09⅜
Lacquer diluent, 140 i.b.p.-200 e.p.	.09⅛	.09⅜	.09⅛	.09⅜
Rubber solvent, 68-70 gr., 100 i.b.p.-300 e.p.	.06⅛	.06⅝	.05⅞	.06⅜
Stoddard solvent, 300 i.b.p.-410 e.p., over 100° flash	.05¼	.05½	.05	.05¼
Pet. thinner, 290, 300 i.b.p.-415 e.p., over 83° flash	.04¾	.05	.04½	.04¾
V.M.&P. naphtha, 56-58 gr., 190-200 i.b.p.-330 e.p.	.05⅝	.05⅞	.05⅜	.05⅝
Petroleum spirits	.04¼	.04⅝	.04	.04⅜

NATURAL GASOLINES

	Mar. 29		Mar. 22	
OKLAHOMA (Group 3)—				
Grade 18-55	.02½	.02¾	.02⅜	.02½
Grade 26-70	.02		.01¾	.02
Grade 30-70	.01⅞		.01⅝	.01¾
NORTH TEXAS—				
Grade 18-55	.02½	.02⅝	.02⅜	.02½
Grade 26-70	.02	.02⅛	.01¾	.01⅞
Grade 30-70	.01⅞		.01⅝	
NORTH LOUISIANA—				
Grade 26-70	.02⅜		.02¼	
CALIFORNIA—				
75-78 375	.04¼	.05	.04¼	.05

Note—Grades 18-55, 26-70 and 30-70 are three of 24 grades adopted by the Natural Gasoline Association of America effective January 1. The grades are based on pounds vapor pressure and amount evaporated at 140° F. See page 74 of January 7 issue for explanation of new grading system. While not exactly the same specifications apply. Grade 18-55 corresponds to the former Grade A; Grade 26-70 to former Grade AA and Grade 30-70 to former Grade BB.

KEROSENES

(All kerosenes water white)

	Mar. 29		Mar. 22	
OKLAHOMA (Group 3)—				
41-43	.02¾	.02⅞	.02⅝	.02¾
42-44	.02⅞	.03	.02¾	.02⅝
NORTH TEXAS—				
40-41	.02¾		.02⅝	
41-43	.02⅞		.02¾	
‡NORTH LOUISIANA—				
41-43	.03¼		.03¼	
42-44	.03½		.03½	
‡ARKANSAS—				
41-43	.03¼		.03	
PENNSYLVANIA (inland refineries)—				
45	.04	.04¼	.04	
46	.04¼	.04⅜	.04¼	
47	.04½		.04⅜	
CHICAGO (Based on Group 3)—				
41-43	.02¾	.03	.02⅝	.02⅞
42-44	.03	.03⅛	.02⅞	.03
***CALIFORNIA—**				
38-40 high burning test	.03¾	.04½	.03¾	.04½
NEW YORK (Bayonne, N. J.)—				
41-43	.05¼	.05½	.05¼	.05½

*For Pacific Coast consumption.

‡For Arkansas, Louisiana and Mississippi delivery.

TRACTOR FUELS*

	Mar. 29		Mar. 22	
OKLAHOMA (Group 3)—				
39-40 prime white	.02¼	.02½	.02¼	
38-40 light straw	.02⅛	.02¼	.02	.02⅛
NORTH TEXAS—				
38-40 light straw	.02	.02¼	.02	.02¼
CHICAGO (Based on Group 3)—				
38-40 light straw	.02¼	.02¼	.02	.02⅛
PENNSYLVANIA (inland refineries)—				
41-43 prime white	.03¾	.04	.03½	.03¾

*There are no standard specifications for tractor fuels. Grades commonly sold have flash under 175° F. (open cup) and under 575° F. endpoint and less than .2 per cent sulphur. Tractor fuels are available from all Mid-Continent refining groups at prices in line with the Oklahoma market taking into consideration differentials in freight rates.

FURNACE OILS*

	Mar. 29		Mar. 22	
OKLAHOMA (Group 3)—				
32-36 straw	.01⅞	.02	.01¾	.01⅞
36-38 straw	.01⅞	.02	.01¾	.02
38-40 straw	.02	.02⅛	.01⅞	.02⅛
39-41 prime white	.02¼	.02⅜	.02⅛	.02¼
NORTH TEXAS—				
38-40 straw	.02	.02⅛	.02	.02⅛
‡LOUISIANA—				
36-40	.02⅜	.02½	.02¼	.02⅜
‡ARKANSAS—				
32-36	.02¼	.02⅜	.02⅛	.02¼
CHICAGO (Based on Group 3)—				
32-36 straw	.01⅜	.01⅞	.01⅝	.01¾
38-40 straw	.01⅞	.02	.01¾	.02
PENNSYLVANIA (inland refineries)—				
40-41 prime white	.03½		.03½	
NEW YORK (Bayonne, N. J.)—				
32-36	.04		.03½	
36-40	.05		.04½	

*Above prices are for furnace oils of zero cold test, under 190° F. flash and good odor.

‡For Arkansas, Louisiana and Mississippi delivery.

GAS OIL, DIESEL OIL AND FUEL OIL

Gas oil (G.O.) quoted per gallon basis; Diesel oil and fuel oil per barrel.

	Mar. 29		Mar. 22	
OKLAHOMA (Group 3)—				
32-36 (G.O.) cracking stock	.01¼	.01⅜	.01⅛	.01¼
U.G.I. (G.O.)	.01⅛	.01⅜	.01	.01¼
32-36, zero to 15 (G.O.) high flash	.01½	.01¾	.01⅜	.01½
28-30, zero to 10	.50	.55	.50	.55
26-30, zero to 10	.45	.50	.45	.50
24-26	.37½	.42½	.37½	.42½
20-22	.30	.32½	.30	.32½
16-20	.25	.27½	.25	.27½
Below 16	.22½	.25	.22½	.25
NORTH TEXAS—				
32-36 (G.O.) industrial	.01⅛	.01¼	.01⅛	
22-26	.40		.40	.45
Below 20	.25	.35	.30	.35
‡NORTH LOUISIANA—				
32-36 (G.O.) zero	.02	.02¼	.02	.02⅛
14-16	.35	.40	.35	.40
‡ARKANSAS—				
30-32 (G.O.) zero	.02	.02¼	.02	
14-16	.35	.40	.35	.40
CHICAGO (Based on Group 3)—				
32-36 (G.O.) industrial	.01	.01¼	.01	.01¼
28-30 (zero)	.52½	.57½	.52½	.57½
22-26	.32½	.37½	.32½	.37½
18-22	.27½	.30	.27½	.30
Below 18	.22½	.25	.22½	.25
PENNSYLVANIA (inland refineries)—				
36-40	.03	.03⅛	.02⅞	

Note—Fuel oils of more than 40 cold test generally 5 to 10 cents per barrel less in all areas than shown in above tables.

‡For Arkansas, Louisiana and Mississippi delivery.

CALIFORNIA—				
30-34 (G.O.) per bbl.	.80	1.00	.80	1.00
27 plus Diesel	.75	.95	.75	.95
15-19 bunker (at tidewater)	.55	.75	.55	.75
15-19 bunker (cargo lots)	.55	.70	.55	.70
15-19 (tank cars)	.40	.70	.40	.70
GULF COAST—				
28-30 (G.O.)	.02⅜	.02⅝	.02¼	.02½
Bunker C (bulk cargoes)	.42	.43	.38	.40
Bunker C (bunkers)	.45	.50	.45	
NEW YORK (Bayonne, N. J.)—				
28 plus (G.O.)	.03½	.04	.03½	.04
*28-30 Diesel	1.30		1.30	
†Bunker C	.65		.60	

*Lighterage 6½ cents per barrel.

†Lighterage 5 cents per barrel.

PETROLEUM COKE*

Prices per ton f.o.b. refineries in Chicago area.

	Mar. 29		Mar. 22	
Breeze (screenings)	3.75		3.75	
Still runs	4.75		4.75	
Lump and egg	7.00	7.50	7.00	7.50

*Refiners will absorb freight up to 80 cents a ton.

NEUTRAL OILS

(Viscosity at 100° F., and Color)

	Mar. 29		Mar. 22	
OKLAHOMA (Group 3)—				
Zero to 10 Cold Test:				
150-3	.06¼	.06½	.06¼	.06½
180-3	.07½	.07¾	.07½	.07¾
180-4	.07	.07¼	.07	.07¼
200-3	.08½		.08½	
200-4	.08	.08¼	.08	.08¼
240-3	.09¾	.10	.09¾	.10
240-4	.09¼	.09½	.09¼	.09½
280-3	.11¼	.11½	.11¼	.11½
280-4	.10¼	.10½	.10¼	.10½
300-3.5	.11¾	.12	.11¾	.12
350-3.5	.12¼	.12½	.12¼	.12½
400-4	.12¾	.13	.12¾	.13
500-4.5	.13¼	.13½	.13¼	.13½
100-2 Paraffin Oil	.04¼	.04½	.04¼	.04½
15-30 Cold Test:				
200-3	.07¾	.08	.07¾	.08
200-4	.07½	.07¾	.07½	.07¾
240-3	.09¼	.09½	.09¼	.09½
240-4	.08¾	.09	.08¾	.09
280-3	.10¾	.11	.10¾	.11
280-4	.09¾	.10	.09¾	.10
PENNSYLVANIA—				
150 vis. No. 3, 400-405:				
Zero pour test	.15	.17		
10 pour test	.14	.16		
15 pour test	.13½	.15½		
25 pour test	.12¾	.13¼		
30 pour test	.12¾	.13		
180 vis. No. 3, 25 pour test	.15½	.16½		
200 vis. No. 3:				
Zero pour test	.22½	.24		
10 pour test	.21½	.23		
15 pour test	.19½	.21		
25 pour test	.18	.19		
30 pour test	.17¾	.18		
36 Miners Neutral	.05½		.05½	
34 Neutral	.05½		.05½	
34 Sundebloom Neutral	.05		.05	
GULF COAST—				
Pale Oils:				
100-2-2½	.05		.04½	.05
200-3	.06½		.06	.06¼
300-3	.07		.06½	.07
500-3½	.08	.08½	.08	.08½
750-3½	.09	.09½	.09	.09½
1,200-3½	.10½	.11	.10½	.11
2,000-4	.12	.12½	.12	.12½
Red Oils:				
200-5-6	.05	.05½	.05	.05½
300-5-6	.05½	.06	.05½	.06
500-5-6	.06¾	.07	.06¾	.07
1,200-5-6	.09½	.10	.09½	.10
2,000-6 plus	.11	.11½	.11	.11½
CALIFORNIA—				
Pale Oils:				
100-2½-3	.08	.08¼	.08	.08¼
200-2½-3	.08	.08¼	.08	.08¼
300-3-3½	.08½	.08¾	.08½	.08¾
350-3-4	.09	.09¼	.09	.09¼
400-3-4	.09½	.09¾	.09½	.09¾

REFINERY AND CRUDE PRICES

Quotations on refined products are for interstate or export movement unless otherwise noted.

350-3-4	.10	.10¼	.10	.10¼
550-3-4	.10½	.11	.10½	.11
Red Oils:				
200-4½-5	.08	.08¼	.08	.08¼
300-5-6	.08½	.08¾	.08½	.08¾
350-5-6	.09	.09¼	.09	.09¼
400-5-6	.09½	.09¾	.09½	.09¾
450-5-6	.10	.10¼	.10	.10¼
500-5-6	.10½	.11	.10½	.11
600-5-6½	.11½	.12	.11½	.12
700-6½ plus	.12½	.13½	.12½	.12¾
750-6½ plus	.13	.13½	.13	.13½
900-6½ plus	.14½	.14¾	.14½	.14¾
NEW YORK (Bayonne, N. J.)—				
Paraffin Oil:				
25 pale	.10¼		.10¼	
2s pale	.07¼		.07¼	
280 red	.12½		.12½	
250 red	.11½		.11½	
225 red	.10		.10	
200 red	.09¼		.09¼	

BRIGHT STOCKS AND STEAM REFINED STOCKS

OKLAHOMA (Group 3)—	Mar. 29		Mar. 22	
600 light green S.R.	.04	.06	.04	.06
600 dark green S.R.	.03	.04½	.03	.04½
Bright Stock:				
190-200 D	.20		.17½	.18
150-160 D, 0-10	.17¾	.18	.16	
150-160 D, 10-25	.17¼	.17½	.15	.15½
150-160 D, 25-40	.16¾	.17	.14½	.15
150-160 E	.16¾	.17	.14½	.15

PENNSYLVANIA—				
600 S.R.	.13½	.14	.13½	
650 S.R.	.15½	.16	.15½	.15¾
600 Pennsylvania flash	.17	.17¼	.16½	.16¾
600 D filtered	.20	.20½	.20	.20½
600 E filtered	.15¾	.16	.15¾	.16
Pennsylvania Grade bright stock:				
Bright Stock, No. 8 color, 145-50 vis., 210-540-550 flash:				
10 pour test	.25	.27		
15 pour test	.22½	.23		
25 pour test	.21½	.22		
35 pour test	.21	.22		

WAX AND PETROLATUM

(Prices per pound)

OKLAHOMA (Group 3)—	Mar. 29		Mar. 22
124-126 white crude scale	.01¾	.01⅞	.01¾
PENNSYLVANIA—			
122-124	.02	.02⅛	.0205
124-126	.02⅛	.02¼	.0205
NEW YORK (Bayonne, N. J.)—			
Refined Wax:			
120-122	.02⅞		.02⅞
125-127	.03⅛		.03⅛
130-132	.03⅝		.03⅝
133-135	.04¼		.04⅛
135-137	.04¼		.04¼
Petrolatum in barrels in carload lots:			
Dark green	.01¾		.01¾
Amber	.02⅛		.02⅛
Extra amber	.02⅝		.02⅝
Cream	.04¾		.04¾
Lily white	.05¾		.05¾
Snow white	.06¾		.06¾

EXPORT PRICES

GASOLINE

GULF COAST—	Mar. 29		Mar. 22	
U. S. Motor	.04¼	.04¼	.04	.04⅛
60-62 400	.04¼	.04⅜	.04⅛	.04¼
61-63 390	.04½		.04¼	
64-66 375	.04½	.04⅝	.04¼	.04⅜
LOS ANGELES, CALIF.—				
U. S. Motor, 53-55 437 e.p.	.03¾	.04¼	.03¾	.04¼
U. S. Motor, 65 octane num.	.05		.05	
U. S. Motor, 67 octane num.	.05¼		.05½	
U. S. Motor, 69 octane num.	.05½		.05½	
58-62 400 endpoint gasoline	.04¼		.04¼	.04¾

KEROSENE

41-43 prime white	.04	.04⅛	.04	
41 water white	.04¼	.04⅜		
LOS ANGELES, CALIF.—				
41-43 water white	.04	.04¾	.04	.04¾

LUBRICANTS

NEW YORK (Bayonne, N. J.)—				
600, steam refined cylinder stocks, in bbls.	.21	.22	.21	.22
650, steam refined	.23½	.24	.23½	.24
600, Pennsylvania flash	.24½	.25	.24½	.25
630, Pennsylvania flash	.27½	.28	.27½	.28
600, Warren E	.23½	.24	.23½	.24
600, Oil City E	.22½	.23	.22½	.23
Light 140-150 Bright Stocks	.30	.31	.30	.31
Dark 140-150 Bright Stocks	.29	.30	.29	.30

CALIFORNIA CRUDE OIL PRICES

STANDARD OIL CO. OF CALIFORNIA

For its current purchases of crude oil at the well (unless otherwise specified) for allowable crude oil produced in accordance with allocations made by the California Statewide Curtailment Committee. All gravities above those quoted take highest price offered in that field. Effective June 19, 1931, at 7 a.m.

Gravity	Signal Hill	Seal Beach, Alamitos Heights	Huntington Beach	Inglewood	Olinda-Brea, Canon	Torrance	Richfield	Coyote Hills	Santa Fe Springs	Midway-Sunset, Elk Hills Buena Vista Hills	Lost Hills
14-14.9	$.65	$.65	$.65	$.65	$.65	$.65	$.65	$.65	...	$.55	$.55
15-15.9	.65	.65	.65	.65	.65	.65	.65	.65	...	.55	.55
16-16.9	.65	.65	.65	.65	.65	.65	.65	.65	...	.55	.55
17-17.9	.65	.65	.65	.65	.65	.65	.65	.65	...	.55	.55
18-18.9	.65	.65	.65	.65	.65	.65	.65	.65	...	.55	.55
19-19.9	.65	.65	.65	.65	.65	.65	.65	.65	...	.55	.55
20-20.9	.65	.65	.65	.66	.66	.65	.65	.65	...	.55	.55
21-21.9	.65	.65	.65	.68	.67	.65	.66	.65	...	.55	.57
22-22.9	.65	.65	.66	.70	.68	.66	.68	.65	...	.56	.59
23-23.9	.67	.67	.68	.72	.70	.67	.70	.66	...	.58	.60
24-24.9	.69	.69	.70	.74	.72	.68	.72	.67	$.65	.61	.62
25-25.9	.71	.71	.72	.76	.74	.70	.74	.69	.65	.64	.64
26-26.9	.73	.73	.74	...	.76	...	...	.71	.65	.66	.65
27-27.9	.75	.75	.76	...	.78	...	...	.73	.68	.68	.67
28-28.9	.77	...	...	...	.80	...	...	.75	.71	.71	.69
29-29.9	.79	...	...	...	...	...	...	.77	.73	.74	.71
30-30.9	.81	...	...	...	...	...	...	.79	.75	.76	.72
31-31.9	...	...	...	...	...	...	...	...	.78	...	...
32-32.9	...	...	...	...	...	...	...	...	.80	...	...
33-33.9	...	...	...	...	...	...	...	...	.83	...	...
34-34.9	...	...	...	...	...	...	...	...	.85	...	...
35-35.9	...	...	...	...	...	...	...	...	.87	...	...

Standard Oil Co. of California prices in other fields:

(Continued on Page 152)

CRUDE OIL PRICES

OKLAHOMA, KANSAS, NORTH AND EAST CENTRAL TEXAS

East Texas (Nov. 2, 1931)† ..... $ .83
Corsicana heavy (Nov. 2, 1931)* ..... .49
Other fields.....See gravity table

†Posted by Panola Pipe Line Co., Magnolia Petroleum Co., Tidal Refining Co., Sinclair Refining Co., Gulf Pipe Line Co., Atlas Pipe Line Co. *Magnolia Petroleum Co.

EASTERN STATES

Joseph Seep Purchasing Agency
(Effective December 16, 1931)

Pennsylvania Grade Oil in National Transit Lines (Bradford Field) (Mar. 14, 1932) $1.82
Pennsylvania Grade Oil in Southwest Pennsylvania Lines 1.55
Penna Grade Oil in Eureka Pipe Line Lines (West Virginia) (Feb. 26, 1932) 1.50
Penna Grade Oil in Buckeye Pipe Line Lines (Mar. 12, 1932) 1.35
Corning Grade Oil in Buckeye Pipe Line Co.'s line (Nov. 9, 1931) ..... .85
Ragland Grade Oil in Cumberland Pipe Lines (Kentucky) (Jan. 10, 1931) .... .60
Wayne district Oil in Cumberland Pipe Lines (April 23, 1931) 1.17

Tide Water Pipe Co.
(Effective March 14, 1932)

Bradford, Pa. $1.82
Allegany, N. Y. 1.82

Pure Oil Co.
(Effective December 16, 1931)

Cabin Creek, W. Va. $1.45
Bradford Hollow, W. Va. 1.45
Kelly's Creek, W. Va. 1.45

Pennsoil Co.
(Effective March 14, 1932)

Pennsylvania Grade Oil in National Transit Lines:
Group A $1.77
Includes Cochran, Franklin, Hamilton and Doolittle districts.
Group B 1.76
Includes Titusville district.
Group C 1.75
Includes Turkey and Tidiout districts.
Group D 1.74
Includes Bear Creek and Porkey districts.
Group E 1.72
Includes Eldenau, Bull Creek, Rough Run, Carbon, Dipner, Bredin, McJunkin, Jameson, Kennerdell, Emlenton, Tiona, Lacy and Kinzua districts.
Price depends on length of pipe line haul to plant at Oil City.

TEXAS PANHANDLE

Gray County, Wheeler County and Carson-Hutchison Counties.....See gravity table

ROCKY MOUNTAIN STATES

Ohio Oil Co.-Midwest Refining Co.

Ilea, light (Aug. 24, 1931) ..... $ .75
Ilea, heavy (Aug. 24, 1931) ..... .53
Fort Collins (Nov. 3, 1931) ..... .71
Florence (Nov. 3, 1931) ..... .65
Wellington (Nov. 3, 1931) ..... .61
Dutton Creek (Nov. 3, 1931) ..... .75
Rock Creek, Wyo. (Nov. 3, 1931) .... .85
Frannie, light (Nov. 3, 1931) ..... .61
Frannie, heavy (Nov. 3, 1931) ..... .51
Salt Creek.....Mid-Continent gravity table
Big Muddy (Nov. 3, 1931) ..... .83

CRUDE OIL GRAVITY TABLE

Gravity	Kansas and Oklahoma 1	North and Central Texas 2	East Central Texas 3	Gray County, Texas 4	Carson and Hutchinson Counties, Texas 5	Salt Creek, Wyo. 6	North Louisiana and Arkansas 7	Gulf Coast (Tex. and La.) 8	Cameron Meadows, La. 9
Below 25 degrees	...	...	...	...	...	...	...	$.70	$.60
25-25.9 degrees	...	...	...	...	...	...	...	.71	.60
26-26.9 degrees	...	...	...	...	...	...	...	.72	.61
27-27.9 degrees	...	...	...	...	...	...	...	.73	.62
28-28.9 degrees	...	...	...	...	...	...	...	.74	.63
Below 29 degrees	$.61	$.61	$.61	...	...	$.61	$.61	...	...
29-29.9 degrees	.63	.63	.63	...	...	.63	.63	.75	.64
30-30.9 degrees	.65	.65	.65	...	...	.65	.65	.76	.65
31-31.9 degrees	.67	.67	.67	...	...	.67	.67	.77	.66
32-32.9 degrees	.69	.69	.69	...	...	.69	.69	.78	.67
33-33.9 degrees	.71	.71	.71	...	...	.71	.71	.79	.68
34-34.9 degrees	.73	.73	.73	$.61	$.56	.73	.73	.80	.69
35-35.9 degrees	.75	.75	.75	.63	.58	.75	.75	.81	.70
36-36.9 degrees	.77	.77	.77	.65	.60	.77	.77	.82	.71
37-37.9 degrees	.79	.79	.79	.67	.62	.79	.79	.83	.72
38-38.9 degrees	.81	.81	.81	.69	.64	.79	.81	.84	.73
39-39.9 degrees	.83	.83	.83	.71	.66	.79	.83	.85	.74
40 degrees and over	.85	.85	.85	.73	.68	.79	.85	.86	.75

Column 1—Led by Continental Oil Co. effective November 2, 1931, and adopted on same day by other companies excepting Magnolia Petroleum Co. and White Eagle Oil Corp. and excepting that Carter Oil Co., Gypsy Oil Co. and Pure Oil Co. started their schedule at below 25 degrees, 53 cents; 25 degrees, 55 cents; with 2 cents added for each degree upward to 40 degrees and above at 85 cents. Magnolia Petroleum Co. adopted the price schedule in Oklahoma on January 8, 1932, and the White Eagle Oil Corp. in Kansas on January 1, 1932, on oil from 29 degrees upward, but posted 52 cents for oil below 28 gravity and 54 cents for 28 gravity.

Column 2—Led by Continental Oil Co. effective November 2, 1931, and followed by other purchasers on same day excepting Magnolia Petroleum Co. which met the prices on January 8, 1932, from 29 degrees upward, posting 52 cents for oil below 28 degrees and 54 cents for 28 gravity oil.

Column 3—Humble Oil & Refining Co. on November 2, and by other buyers excepting Magnolia Petroleum Co., which met the prices from 29 degrees upward on January 8, 1932, but posted 52 cents for oil below 28 degrees and 54 cents for 28 gravity oil.

Column 4—Led by The Texas Company, November 2, followed by Humble Oil & Refining Co., Gulf Pipe Line Co. and H. F. Wilcox Oil & Gas Co. same day. Magnolia Petroleum Co., January 8, 1932.

Column 5—Led by The Texas Company, November 2, followed on same day by Humble Oil & Refining Co. and Gulf Pipe Line Co. Magnolia Petroleum Co., January 8, 1932.

Column 6—Midwest Refining Co., November 2.

Column 7—Standard Oil Co. of Louisiana, November 4, 1931; The Texas Company, Gulf Refining Co. and Louisiana Oil Refining Co. same day. Magnolia Petroleum Co., January 8, 1932.

Column 8—Led by The Texas Company, November 2, followed on same day by Humble Oil & Refining Co., Magnolia Petroleum Co., Gulf Pipe Line Co. and Sun Oil Co., but two last named companies' schedules stop at 35 degrees and above at 81 cents, and the Sinclair Refining Co., but latter company's schedule stops at 31 degrees and above at 71 cents. Magnolia Petroleum Co. applied this schedule to Lockport and Iowa, La.

Column 9—Magnolia Petroleum Co., January 8, 1932.

Grass Creek (Nov. 3, 1931)	1.05
Elk Basin (Nov. 3, 1931)	1.05
Lance Creek (Aug. 24, 1931)	1.05
Poison Spider (Mar. 5, 1931)	.70
Notches (Mar. 14, 1927)	.65
Hudson (June 2, 1931)	.65
Lander (Mar. 5, 1931)	.40
Rex Lake (Feb. 22, 1930)	1.10
Osage (Apr. 15, 1931)	.98
Lost Soldier (Nov. 3, 1931)	.69
Hamilton Dome (Nov. 3, 1931)	.45
Greybull (Nov. 3, 1931)	1.05
Cat Creek (Nov. 3, 1931)	1.05
Pondera (Nov. 3, 1931)	.90
Sunburst, Mont. (Nov. 3, 1931)	1.00
Hogback, N. Mex. (Aug. 24, 1931)	.80
Lea County, N. Mex. (Nov. 3, 1931)	.50
Border, Mont.	1.55
Red Coulee, Alberta	1.55
Dry Creek, Mont. (Aug. 24, 1931)	1.00
Maljamar (Nov. 3, 1931)	.45
Artesia-Jackson (Nov. 3, 1931)	.50

Note—Salt Creek, Cat Creek, Dry Creek, Dallas-Derby, Hudson, Greybull and Hogback posted by Midwest Refining Co. and remainder by Ohio Oil Co. Both companies posted Grass Creek light and Elk Basin. Lost Soldier posted by Producers & Refiners Corp. Artesia, Jackson and Maljamar posted by Continental Oil Co. Border and Red Coulee posted by Imperial Refining Co. Lea County posted by Humble Oil & Refining Co. Fort Collins, Wellington, Orchard, Florence, Rattlesnake and Table Mesa by Continental Oil Co. Osage posted by Arro Oil & Refining Co.

(Continued on Page 148)

TANK WAGON MARKETS

Tank wagon quotations for gasoline and kerosene in United States as furnished by the larger marketing concerns March 29.

ALL TANK WAGON AND SERVICE STATION QUOTATIONS INCLUDE TAXES

STANDARD OIL CO. (INDIANA)

	Gasoline Tank wagon	Gasoline Service station	Gasoline Incl'ds tax of	Kero. tank wagon
Chicago	15.0	15.0	3.0	9.0
Decatur, Ill.	15.5	15.5	3.0	9.1
E. St. Louis	14.8	14.8	3.0	8.3
Joliet	15.5	15.5	3.0	9.1
Peoria	15.5	15.5	3.0	9.1
Quincy	15.3	14.2	3.0	8.9
Davenport, Ia.	15.6	15.6	3.0	9.4
Des Moines	15.6	15.6	3.0	8.1
Keokuk	15.6	15.6	3.0	6.4
Sioux City	15.2	15.2	3.0	9.0
Duluth, Minn.	16.6	16.6	3.0	10.0
Mankato	16.2	16.2	3.0	8.1
Minneapolis	16.3	16.3	3.0	10.0
LaCross, Wis.	17.3	17.3	4.0	10.1
Milwaukee	16.2	16.2	4.0	9.0
Madison	16.4	16.4	4.0	9.2
Detroit, Mich.	12.5	12.5	3.0	9.1
Grand Rapids	14.3	14.3	3.0	10.5
Saginaw	13.2	13.2	3.0	10.8
Evansville, Ind.	16.3	15.6	4.0	10.1
Indianapolis	16.3	16.3	4.0	10.1
South Bend	16.8	16.8	4.0	8.1
Fargo, N. D.	18.0	18.0	3.0	12.0
Huron, S. D.	17.4	16.0	4.0	10.8
Sioux Falls	16.9	16.9	4.0	10.5
K. C., Mo.	15.0	15.0	3.0	7.7
Springfield*	15.0	15.0	3.0	7.0
St. Louis*	14.5	14.5	3.0	8.4
St. Joseph	14.6	14.6	3.0	7.6
Wichita, Kans.	13.9	13.9	3.0	6.1
Bartlesville, Ok.	13.1	15.1	4.0	7.1

*State tax 2 cents, remainder city tax.

A third grade of gasoline, "Stanolind Blue," is sold at all major points at a price 1¼ cents or more below the price on the regular grade.

Effective November 4—New dump discount applicable on all grades of gasoline sold from tank wagon. Any tank wagon customer buying 25 gallons or more at one time will be given 1-cent discount per gallon off tank wagon price at time of delivery. Customers not under contract receive no other discount.

Effective January 1—Discounts on Q.D.A. on 500 gallons or more per month throughout territory; Red Crown Ethyl Gasoline, 3 cents off tank wagon price; Red Crown gasoline, 2½ cents off tank wagon price; Stanolind Blue gasoline, 1 cent off tank wagon price. On deliveries of 75,000 gallons or more each classification allowed 1 cent additional discount.

Discounts on resellers authorized agent's agreement: Same amounts as above except made off service station price instead of tank wagon price.

SOUTHWESTERN DISTRICT

Magnolia Petroleum Co.

	Gasoline Tank wagon	Gasoline Service station	Gasoline Incl'ds tax of	Kero. tank wagon
Dallas, Tex.	15.0	16.0	4.0	9.00
Fort Worth	15.0	16.0	4.0	8.0
Houston	12.0	15.0	4.0	9.0
San Anotnio	14.0	16.0	4.0	8.0
El Paso	13.0	15.0	4.0	11.0
Texarkana	*16.0	16.0	4.0	9.0
Muskogee, Ok.	11.0	13.0	4.0	7.0
Okla. City	13.0	15.0	4.0	7.0
Tulsa	13.0	15.0	4.0	8.0
Ft. Smith, Ark.	*16.5	16.5	5.0	*11.0
Little Rock	*17.5	17.5	6.0	*11.0

One-cent rebate made from posted station prices to cash purchasers in Louisiana, Arkansas and Tennessee.

*Less 2 cents to dealers.

ROCKY MOUNTAIN DISTRICT

Continental Oil Co.

	Gasoline Tank wagon	Gasoline Service station	Gasoline Incl'ds tax of	Kero. tank wagon
Denver, Colo.	14.0	17.0	4.0	12.5
Pueblo	14.0	17.0	4.0	12.0
Grand Jctn.	18.0	21.0	4.0	14.5
Casper, Wyo.	15.0	18.0	4.0	10.0
Cheyenne	13.0	16.0	4.0	11.5
Butte, Mont.	17.0	20.0	5.0	16.0
Billings	18.0	21.0	5.0	14.5
Great Falls	21.0	23.0	5.0	16.0
Helena	20.0	23.0	5.0	16.0
Salt Lake, Utah	17.5	20.5	4.0	16.0
Albu'que, N. M.	17.0	20.0	6.0	14.0
Boise, Idaho	21.0	24.0	5.0	18.0
Twin Falls*	21.0	22.0	5.0	18.0

*Two-cent discount off tank wagon to dealers.

OHIO

Standard Oil Co. (Ohio)

	Gasoline Tank wagon	Gasoline Service station	Gasoline Incl'ds tax of	Kero. tank wagon
Ohio points	16.5	17.0	4.0	*13.0

Dealers and commercial accounts 2 cents under tank wagon.

*Service station price 13 cents.

PENNSYLVANIA-DELAWARE AND PART OF NEW ENGLAND

Atlantic Refining Co.

	Gasoline Tank wagon	Gasoline Service station	Gasoline Incl'ds tax of	Kero. tank wagon
Pittsburgh, Pa.	16.0	17.0	3.0	11.0
Philadelphia	15.0	16.0	3.0	11.0
Scranton	16.0	17.0	3.0	11.0
Allentown	16.0	17.0	3.0	11.0
Altoona	16.0	17.0	3.0.	11.0
Erie	16.0	17.0	3.0	11.0
Dover, Del.	16.0	17.0	3.0	11.0
Wilmington	16.0	17.0	3.0	11.0
Springf'd, Mass.	14.3	15.3	3.0	8.5
Worcester	15.8	16.8	3.0	8.5
Boston	15.0	16.0	3.0	9.5
Providence, R.I.	14.0	15.0	2.0	8.5
Hartford, Conn.	15.0	16.0	2.0	10.0
New Haven	15.1	16.1	2.0	10.0

SOUTHERN DISTRICT

Standard Oil Co. (Kentucky)

	Gasoline Tank wagon	Gasoline Service station	Gasoline Incl'ds tax of	Kero. tank wagon
Atlanta, Ga.*	19.5	19.5	6.0	9.0
Augusta	20.0	21.0	6.0	14.0
Macon	17.0	18.0	6.0	12.0
Savannah	18.0	19.0	6.0	11.0
Birm'ham, Ala.	20.5	20.5	6.0	12.0
Mobile	20.0	20.0	5.0	10.0
Montgomery	21.5	21.5	6.0	13.5
Jackson, Miss.	16.0	17.0	5.5	10.0
Vicksburg	17.0	18.0	5.0	8.0
Jack'ville, Fla.	20.0	20.0	7.0	10.0
Miami	21.0	21.0	7.0	13.0
Pensacola	21.0	21.0	7.0	13.0
Tampa	20.0	20.0	7.0	13.0
Lexington, Ky.	17.0	18.0	5.0	10.0
Covington	17.0	18.0	5.0	10.0
Louisville	15.0	16.0	5.0	10.0
Corbin	18.0	19.0	5.0	15.0

A third grade "Kyso Green" is sold at a price generally 2 cents below the price on the regular grade.

In addition to the state tax of 4 cents on gasoline, Montgomery has city and county tax of 2 cents on gasoline and one-half cent on kerosene. Kerosene prices in Georgia include 1-cent tax. In Florida, an inspection fee of 0.125 cent; in Alabama, an inspection fee of one-half cent on kerosene and one-fourth cent on gasoline. To Pensacola, Montgomery and Birmingham state taxes add 1-cent levy tax. To Gulfport state tax add privilege tax of 2 cents. To Mobile state tax add 1-cent city tax and 2½ cents county tax.

Effective April 2 price to dealers 2 cents under posted tank wagon price.

*An additional discount of 1 cent is offered to dealers effective October 6.

ATLANTIC COAST DISTRICT

Standard Oil Co. (New Jersey)

	Gasoline Tank wagon	Gasoline Service station	Gasoline Incl'ds tax of	Kero. tank wagon
Atl'tic City, N.J.	16.2	16.7	3.0	11.5
Newark	15.2	15.7	3.0	8.5
Annapolis, Md.	16.7	17.2	4.0	10.0
Baltimore	15.9	16.4	4.0	8.0
Cumberland	17.7	18.2	4.0	12.0
Wash'g'n, D. C.	15.4	14.9	2.0	10.0
Danville, Va.	18.5	19.0	5.0	11.8
Norfolk	17.0	17.5	5.0	10.3
Petersburg	18.0	18.5	5.0	11.3
Richmond	17.0	18.0	5.0	10.7
Roanoke	18.7	19.2	5.0	12.0
Charles'n, W.Va.	17.2	17.7	4.0	11.5
Parkersburg	15.9	16.4	4.0	10.2
Wheeling	17.1	17.6	4.0	11.4
Charlotte, N. C.	19.5	19.5	6.0	10.7
Hickory	20.3	20.8	6.0	12.6
Mt. Airy	20.2	20.7	6.0	12.5
Raleigh	19.9	20.4	6.0	12.2
Salisbury	18.5	18.5	6.0	12.5
Charleston, S.C.	18.0	18.5	6.0	10.2
Columbia	19.9	20.4	6.0	12.2
Spartanburg	20.2	20.7	6.0	12.5

Two and one-half cents per gallon discount off tank wagon price of gasoline to dealers except Washington, D. C., and States of Maryland and New Jersey, where discount is 3½ cents.

Prices shown above are for standard gasoline.

NEW YORK AND PART OF NEW ENGLAND DISTRICT

Standard Oil Co. (New York)

	Gasoline Tank wagon	Gasoline Service station	Gasoline Incl'ds tax of	Kero. tank wagon
Albany, N. Y.	15.5	16.5	3.0	9.5
New York*	14.0	16.0	3.0	9.0
Buffalo	15.5	16.5	3.0	8.5
Rochester	15.5	16.5	3.0	8.5
Syracuse	17.3	17.3	3.0	9.0
Boston, Mass.	15.0	16.0	3.0	8.5
Augusta, Me.	17.3	18.3	4.0	9.0
Manch'tr, N. H.	16.9	17.9	4.0	8.5
Burlington, Vt.	17.8	18.8	4.0	9.5

*Prices in steel barrels.

PACIFIC COAST TERRITORY

Standard Oil Co. of California*

	Gasoline Tank truck	Gasoline Posted retail	Gasoline Incl'ds tax of	Kero. tank wagon
Fresno	12.5	16.5	3.0	17.0
San Francisco	12.5	16.5	3.0	15.5
Los Angeles	13.0	16.0	3.0	15.5
Reno, Nev.	16.0	20.0	4.0	19.0
Portland, Ore.	14.0	18.0	4.0	16.5
Seattle, Wash.	15.0	19.0	5.0	16.5
Tacoma	15.0	19.0	5.0	16.5
Spokane	18.5	22.5	5.0	20.5
Phoenix, Ariz.	14.5	17.0	5.0	20.0

Above prices are at company's plant or depots as company does not operate stations. A 4-cent per gallon discount is given dealers and customers taking tank wagon lots except in Phoenix where the discount is 1 cent.

*Retail prices posted by Standard Stations, Inc., a subsidiary.

CENTRAL SOUTH DISTRICT

Standard Oil Co. (Louisiana)

	Gasoline Tank wagon	Gasoline Service station	Gasoline Incl'ds tax of	Kero. tank wagon
N. Orleans, La.	16.5	16.5	6.0	†10.0
Baton Rouge	17.0	17.0	5.0	†12.0
Alexandria	16.5	16.5	6.0	10.0
Lafayette*	18.0	18.0	6.0	†10.0
Lake Charles*	17.5	17.5	6.0	†12.0
Shreveport	15.0	15.0	5.0	†12.0
Knoxville, Tenn.	21.5	21.5	7.0	13.5
Memphis	19.0	19.0	7.0	11.0
Chattanooga	21.0	21.0	7.0	11.0
Nashville	20.5	20.5	7.0	12.5
Bristol	20.0	20.0	7.0	14.0
Lt. Rock, Ark.	18.0	18.0	6.0	11.0

*Includes city tax of 1 cent. Louisiana kerosene prices include 1-cent state tax. New Orleans kerosene price also includes 1-cent city tax.

†Kerosene prices in Louisiana include 1 cent tax except New Orleans where tax is 2 cents.

Two-cent discount off gasoline and kerosene tank wagon price to dealer and commercial accounts.

NEBRASKA

Standard Oil Co. (Nebraska)

	Gasoline Tank wagon	Gasoline Service station	Gasoline Incl'ds tax of	Kero. tank wagon
Omaha	14.9	15.9	4.0	9.25
McCook	17.0	17.0	4.0	7.5
Norfolk	16.75	17.75	4.0	9.75
N. Platte	17.75	18.75	4.0	10.50
Scottsbluff	17.0	17.0	4.0	9.0

Note—Dealers' discount allowed as follows: Red Crown Ethyl, 3 cents off station price; Red Crown, 2½ cents off normal service station price; Nebraska Blue (third grade), 1 cent off normal service station price.

NAPHTHA

	Tank wagon	Tank car
Oleum spirits	10.7	6.23
V.M.P. naphtha	12.7	7.73
Cleaners' naphtha	15.2	9.23
Stanisol	15.2	9.23

Tank wagon prices f.o.b. Chicago January 6, 1932. Each of above prices subject to discount of 1 cent per gallon for 150-gallon lots if covered by contracts.

STANOLIND FURNACE OIL IN CHICAGO

Effective July 1, prices f.o.b. Chicago, tank wagon prices: 1 to 99 gallons, 8 cents; 100 gallons or more, 6 cents.

Stanolex Fuel

Effective May 9, f.o.b. Chicago, tank wagon prices: 1 to 199 gallons, 7 cents; 200 gallons or more, 5 cents. Sinclair met this by bringing down the price of its No. 3.

Fuel Oils

Chicago tank wagon prices (in lots of 400 gallons and over): 35-40 straw distillate, 6 cents; 32-36 gas oil (light zero), 5.5 cents; 32-36 gas oil (industrial), 5.25 cents; 28-30 zero fuel oil, 5 cents; 24-26 fuel oil, 4.25 cents; 18-22 fuel oil, 3.75 cents.

TANK WAGON CHANGES

Standard Oil Co. of New York, effective March 25, advanced gasoline tank wagon and service station prices one-half cent in New York and New England.

Atlantic Refining Co., effective March 21, advanced gasoline tank wagon and service station prices 1 cent at Philadelphia. Company, effective March 28, advanced gasoline tank wagon and service station prices 1 cent in remainder of Pennsylvania and Delaware.

Standard Oil Co. of Louisiana, effective March 24, advanced gasoline tank wagon and service station prices one-half

(Continued on Page 155)

CRUDE OIL PRICES

(Continued from Page 147)

WEST TEXAS

Iatan and Westbrook..Same as North Texas
Crane, Upton, Crockett, Howard, Glasscock, Ector, Winkler and Pecos Counties* ..... $ .50
Lea County, N. Mex.‡ ..... .50
Toborg, Pecos County, Aug. 25, 1931† ..... .35

*The Texas Company, November 2, 1931; Magnolia Petroleum Co., Humble Oil & Refining Co., Gulf Pipe Line Co., same day. †Shell Petroleum Corp. ‡Humble Oil & Refining Co., The Texas Company, November 2, 1931.

GULF COAST

Grade A and Grade B classifications discontinued by leading buyers.....
.....See gravity table
Jenninga, La. (Nov. 2, 1931)* ..... $ .61
Lockport, La. (Aug. 27, 1931)† .....
.....See Gulf Coast gravity table
Refugio, light.....See gravity table
Refugio, heavy (Nov. 2, 1931)‡ ..... .75
Markham (Nov. 2, 1931)§ ..... .67
High Island (Nov. 2, 1931)¶ ..... .65

*Gulf Refining Co. †Magnolia Petroleum Co. ‡Humble Oil & Refining Co. §The Texas Company. ¶Gulf Pipe Line Co.

NORTH LOUISIANA AND ARKANSAS

Smackover, Ark. (all grades) (Nov. 4, 1931) ..... $ .55
Urbana, Ark. .....See note below
Bellevue, La. (June 3, 1931) ..... .35
Urania, La. (Nov. 2, 1931) ..... .50
Calion, Ark. (Aug. 22, 1931) ..... .53
East El Dorado, Ark. (Nov. 4, 1931) ..... .55
Stephens, Ark., below 29° (Aug. 24, 1931) ..... .61
Stephens, Ark., 29° and above (Aug. 24, 1931) ..... .44
Other fields.....See gravity table

Note—Smackover, all grades, Standard Oil Co. of Louisiana, The Texas Company, Gulf Refining Co., Magnolia Petroleum Co., Bellevue posted by Magnolia Petroleum Co.; Urania by H. L. Hunt, Inc., and Louisiana Oil Refining Co.; Calion by Gulf Refining Co.; East El Dorado by Gulf Refining Co. and Magnolia Petroleum Co.; Stephens, Ark., by Louisiana Oil Refining Co. and Atlantic Oil Producing Co.

SOUTH CENTRAL AND SOUTHWEST TEXAS

Darst Creek (Nov. 2, 1931)‡ ..... $ .60
Luling (Nov. 2, 1931)† ..... .40
Mirando (Nov. 2, 1931)† ..... .75
Pettus (Nov. 2, 1931)* ..... .35
Salt Flat (Nov. 2, 1931)* ..... .60
Thrall§ .....
Lytton Springs (Lockhart) ..See gravity table
Dobrowolski¶ .....
Same as Mid-Continent gravity scale up to and including 38-38.9°.
Somerset¶ .....
Same as Mid-Continent gravity scale up to and including 38-38.9°.

‡The Texas Company. *Humble Oil & Refining. †Magnolia Petroleum Co. §Thrall prices same as North Central Texas less 19½ cents per cwt. freight. ¶Grayburg Oil & Refining Co., Pioneer Oil & Refining Co. and Texas Petroleum Products. ‖Pioneer Oil & Refining Co.

MIDDLE WESTERN STATES

Ohio Oil Co.

(Effective November 3, 1931)

Lima $1.00
Wooster 1.15
Illinois ..... .95
Indiana ..... .60
Princeton ..... .95
Plymouth .....Shut in
Western Kentucky ..... .90
Midland, Mich. (Oct. 9, 1931)* ..... .55
Dundee, Mich.† .....
Same as Stanolind Crude Oil Purchasing Co.'s Mid-Continent gravity scale
Upper and Lower Traverse Sanda, Mich.† ....Same as Mid-Continent gravity scale
Somerset, Ky. (Nov. 4, 1931) ..... .80
Hart County, Ky. (Jan. 18, 1932)‖ ..... .60

*Posted by Pure Oil Co. †Posted by Standard of Indiana for boat shipment. ‖Posted by Stoll Refining Co. Somerset, Ky., crude purchased by Ashland Refining Co., Ashland, Ky., and delivered through own pipe line.

MEXICO

Panuco* ..... $ .45

*F.o.b. ship, based on February transactions and exclusive of production and export taxes and bar dues.

CANADA

Ontario (Nov. 3, 1931):
Petrolia* $1.90
Oil Springs* 1.97
Alberta (Aug. 24, 1931):
Turner Valley†:
Crude oil 45-45.9 ..... 2.00
Crude oil 50 and above 2.05
Crude naphtha 2.13
Discolored naphtha 2.03

*Imperial Oil, Ltd. †Imperial Oil, Ltd., and Regal Oil & Refining Co.

Of Interest to Sales Departments

"Don't," Says Winship to Those Considering New Service Stations

A warning to all tempted to build filling stations has been issued by Glen B. Winship, New York analyst, who for two years has been conducting a special survey of gasoline marketing conditions throughout the United States.

"To become a filling station operator is an easy way to start business for yourself," he admits, "but it is also an easy way to lose money. Thousands of stations are being operated at a loss, and not more than one in nine yields an adequate profit.

"In more than 10,000 communities of the United States, the number of motor vehicles is not sufficient to warrant a service station. There are 43,476 stations now located in such villages and in rural sections which could be abandoned without inconvenience to car owners, who could be adequately served by the local garages or by stations in nearby towns.

"Of the 6,351 towns and cities large enough to warrant service station operation, at least 5,519 are overbuilt, the most serious conditions existing in towns of less than 50,000 population. In this group, my records show 68,800 service stations, and a careful analysis town by town indicates that 65 per cent, or 13 out of 20, are unnecessary. The best showing is made by the metropolitan group, including all cities of 1,000,000 or more population, but even in this group 44 per cent of stations are not warranted.

"I have discovered only 365 towns in the entire country where additional stations could be built without gross violation of sound business principles, and of these towns 258 are in eight states, and the rest, or 107, are scattered over 29 states. More than $1,000,000,000 has been invested needlessly in gasoline marketing facilities. This reckless investment, instead of increasing the industry's profit, is actually reducing net revenues by at least $455,000,000 annually."

No one should enter this overcrowded industry without the most careful investigation, Mr. Winship believes, and as a result of his study he offers these few rules for the wary:

"Don't build a station merely because traffic is heavy. There is no profit in watching the cars go by.

"Remember that in the vast majority of instances, the station that is permanently successful draws a large part of its trade from car owners living in its immediate vicinity.

"One of the first things to do is to learn exactly how many motor vehicles are registered in your town or city. Then count the number of service stations. Unless there are more than 400 motor vehicles for each station, the best plan is to give up the idea of competing in that locality. There are many other factors to be considered, but this is the best single rule, especially for the inexperienced. This does not mean that the average service station should have 400 customers. Part of the trade is usually absorbed by garages, and you cannot be sure of winning even a fair proportion of local support. Thousands of operators have learned this by bitter experience."

ONTARIO FUEL OIL TAX

CHATHAM, Ontario, Mar. 28.—The Ontario provincial government has given notice of its intention to impose a tax of one-half cent an imperial gallon on fuel oil.

FORD ADOPTS HIGH COMPRESSION MOTOR

The new Ford cars, announced this week, will be driven by motors operating at substantially higher compression ratios and this fact will probably be accepted by refiners as further evidence that the motor car of 1932 will need gasoline of higher octane value than last year.

The new Ford V-Eight will have a compression ratio of 5.5 to 1 and the new Four of 4.6 to 1. The model A motor of a year ago was 4.22 to 1. With this change, the V-Eight motor may be classed as a relatively high compression motor exceeding the Buick, Chevrolet, Dodge, Nash, Plymouth and Pontiac. Among the 10 most popular cars, the new eight will be exceeded in compression ratio by the Hudson and Essex, by the higher priced Studebaker cars equipped with the optional high compression heads and by the Chrysler cars with the optional 6.2 to 1 heads.

Refiners have been interested in watching Ford because his cars have been designed with a relatively low compression motor and the octane rating of the gasoline used to operate these cars was of less concern. While other factors than simply the compression ratio determines the grade of fuel needed, it is generally believed that Ford's choice will prove a constructive step in the program of supplying gasolines of better quality through a greater demand from the motor manufacturers.

OIL JOBBER IS LEFT TO WHISTLE FOR HIS MONEY

The Weekly Nioma Service Bulletin, official publication of the Nebraska Petroleum Marketers, Inc., reports that it has received a flood of complaints from oil jobbers that they have extended credit to farmer customers to enable these farmers to prepare the land, put in the crop, cultivate it, reap it and market it only to find that bankers and dealers in agricultural implements had stepped in first, leaving the oil jobber to "whistle for his money."

"In scores of instances," says the Service Bulletin, "the independent oil man has furnished the necessary products to help the farmer to carry on his agricultural proceedings. It is no more than right that he should get his pay first and the oil man should come under the same protection as the mechanic, the material man, the thresherman, the lawyer and the doctor."

SOVIET INCREASES PETROLEUM EXPORTS

NEW YORK, Mar. 28.—Soviet exports of most of the principal petroleum products showed an increase during 1931 over the previous year. Great Britain was the principal purchaser, having taken 1,001,700 tons in 1931 compared to 973,100 tons the previous year. Italy ranked second. The exports from the Soviet refineries for the past two years were as follows:

	Tons	
	1931	1930
Gasoline	1,782,200	1,470,100
Kerosene	727,600	777,500
Solar oil	37,600	70,700
Gas oil	427,500	423,300
Lubricating oil	223,600	200,500
Fuel oil	1,791,500	1,612,400
Lubricating mazout	4,100	10,500
Crude oil	165,000	197,500
Sakhalin crude	112,000	41,500
Asphalt	6,100	2,200
Miscellaneous	200	300

REDUCE ALABAMA RATES

NEW YORK, Mar. 26.—A temporary order permitting further cuts in petroleum freight rates on shipments from Mobile to Alabama points has been issued by the Alabama Public Service Commission, to meet interstate rates through Mississippi to these points.

Under an order previously issued by the commission, reduced rates effective March 15 were granted from Mobile to Alabama points to meet competition from New Orleans and Baton Rouge shippers, and under the terms of the later order some of these rates are further reduced.

Coastal Petroleum Corp. recently placed its new refinery at Mobile in operation, and the favorable freight rate action by the Alabama Public Service Commission indicates that the state is fully prepared to foster the state's refining industry in every way possible.

COMMITTEE INTERPRETS AIRPORT SERVICE RULE

The rule of the National Code of Practices for Marketing Refined Petroleum Products affecting dispensing and storage equipment for airports is the subject of a general interpretation by the National Committee on Interpretation of the Code. Rule B (formerly Rule 8), Group 11, of the code was given the following interpretation Secretary Paul E. Hadlick of the committee on interpretation has advised all code committee chairmen:

"Any leasing or lending of dispensing or storage equipment of any kind to airports or to operators of airplanes even when a rental therefor is received by the lender from the borrower is contrary to the provisions of Rule B of the National Code of Practices for Marketing Refined Petroleum Products, and all refining companies, wholesalers, distributors and jobbers should refrain from leasing, lending or otherwise furnishing such dispensing and storage equipment. However, the above does not prohibit the installation of equipment by a lessee upon property leased in accordance with Rule A and its interpretations."

SUN HAS BRITISH SUBSIDIARY

NEW YORK, Mar. 28.—The British Sun Oil Co., Ltd., United Kingdom marketing subsidiary of the Sun Oil Co. has opened London offices under the direction of Arthur Stephens, managing director for the British subsidiary. The new company will take care of the Sun's marketing in the United Kingdom, including the full line of Sun Golden oils, which have attained wide distribution in the British market.

NEW TANKER LAUNCHED

CHATHAM, Ontario, Mar. 27.—The new Shell Oil Co. tanker "Lakeshell" was launched at Newcastle-on-Tyne, England, on March 19, being christened by Mrs. G. Howard Ferguson, wife of the Canadian high commissioner. The "Lakeshell" with a carrying capacity of 600,000 gallons is the largest tanker ever built in England for the Canadian trade, and will reach Montreal early in April.

SHELL EASTERN COMPANY WILL MARKET ASPHALTS

NEW YORK, Mar. 26.—Shell Eastern Petroleum Products, Inc., had created an asphalt division in its sales department, under the direction of J. S. Sawyer, to handle the sale of "Colas," a cold asphalt used as a road binder.

"Colas," the company says, has unusual characteristics and a number of important advantages over other asphalt materials. It is an emulsion of pure asphalt and water. That is, the asphalt is subdivided into minute particles or globules which, with the assistance of an emulsifying agent, are held suspended in water. By this means, the company states, pure asphalt can be applied to the road surface, cold, and yet be in a highly liquid state. As soon as the "Colas" is spread the minute particles of asphalt are immediately freed from the enveloping water and they run together, depositing an even film of pure asphalt around every piece of stone, thereby firmly binding the road.

"Colas" is the result of intensive research by the Shell organization extending over a period of some 10 years. There are more than 80 factories in operation manufacturing the product. In the United States and Canada "Colas" plants are in operation at New Orleans, Chicago, Rutherford, N. J., Martinez and Los Angeles, Calif., Montreal and Brantford, Ontario, and additional factories are planned.

J. S. Sawyer, manager of Shell Eastern's new sales division, has had many years' experience with the engineering problems of road construction. After undertaking numerous important highway developments for the State of Oregon, he began his association with Shell as manager of the asphalt department of Shell Oil Co. He was then transferred to New York as general manager of Colas Roads, Inc., from which company he has now taken up his new duties with Shell Eastern.

COULD RIDE OUT OF DEPRESSION IN AUTO

"Ride Out of the Depression," is the slogan adopted by one member of the automotive industry. He points out that if each of the 26,000,000 car owners would add but 300 miles to their trips this summer the results would be startling in stimulating business.

He declares that by such a policy, a total of 7,800,000,000 extra car miles would be driven with the following results: Assuming an average of 15 miles to a gallon of gasoline, fuel consumption would be increased by 466,666,666 gallons at a retail cost of about $70,000,000; on a basis of 20,000 miles per tire, 390,000 extra sets of tires would be sold at a retail price of about $15,600,000, and, setting the average car life before replacement at 50,000 miles, 156,000 additional automobiles would be sold for a total of approximately $156,000,000, bringing an aggregate increase in national volume of business of close to $250,000,000.

BIG ORDER GOES TO UNION

The Union Oil Co. of California has signed contracts for delivery of approximately 1,500,000 bbls. of gasoline at Atlantic ports, initial deliveries being made this month. The contracts are based on a sliding scale price and the cargo of 63,000,000 gallons should bring between $3,000,000 and $3,500,000. Deliveries are expected to take more than eight months. According to eastern advices most of the deliveries will be made to one of the Standard oil companies for distribution among outlets.

Oils Continue Firmest Group in List

Leaders Among Petroleum Shares Resist General Market Pressure. Stronger Gasoline Market Offsets Further Increases in Stocks

NEW YORK, Mar. 28.—Oil shares fluctuated within rather narrow limits during the past week, but, as a group, continued to display more firmness than any of the other stock groups. Higher gasoline prices at the Gulf and on the Atlantic Seaboard territory tended to offset the further gains in refinery stocks of motor fuel, and the stronger feeling evidenced in the heavy oil division was also emphasized marketwise as a constructive development.

The Texas Corporation

The Texas Corporation and subsidiaries report for 1931 net loss of $9,954,478 after depreciation, depletion, retirements, intangible development costs, taxes, etc., as compared with net earnings of $15,073,303, or $1.53 a share, on the common in 1930. After payment of $22,165,214 in cash dividends and a downward revision in surplus of $339,577, the deficit for the year was $32,450,260. Earned surplus was reduced by $32,450,260, or from $135,077,737 at the close of 1930 to $102,618,467 as of December 31, 1931.

After payment of dividends and expenditures for plant and permanent investment, total holdings of cash and marketable securities, loans, etc., secured by securities, amounted to $43,553,148, against total current liabilities of $26,948,458. Working capital at the close of 1931 was $155,486,050, equal to $15.78 a share on outstanding stock. The current assets of $182,434,963 were 6.8 times the current liabilities. The corporation reported no bank loans. Inventories of oil at the close of 1931 stood at $98,072,794, against $123,461,069 at the close of the previous year.

Total crude production by the company and subsidiaries in the United States and Mexico during 1931 was 33,627,465 bbls., off 8,659,826 bbls. from the 1930 total. Crude purchases during the year totaled 35,047,053 bbls., against 31,040,428 bbls. in 1930. Acreage held declined to 6,279,023 acres from 7,112,622 acres. Pipe line runs totaled 63,049,616 bbls., an increase of 3,747,408 bbls. The company had 6,556 producing wells at the close of the year, a reduction of 545 wells. Operating expenses during 1931 decreased $19,377,178, or 16.3 per cent compared with 1930.

Texas Pacific

Texas Pacific Coal & Oil Co. reports as of December 31, 1931, current assets of $3,382,933, including $328,305 cash, and current liabilities of $2,235,630, compared with current assets of $4,908,143 (including $1,226,681) and current liabilities of $2,880,436 on December 31, 1930.

Sinclair Changes

Earl W. Sinclair has resigned as president of Sinclair Consolidated Oil Corp. and has been elected chairman of the finance committee. Herbert R. Gallagher, former Shell executive, was elected president and a director. These changes are preliminary to the merger of the Sinclair company with Prairie Oil & Gas Co. and Prairie Pipe Line Co.

Barnsdall Oil

Stockholders of the Barnsdall Corp. have voted to reduce the par value of the company's capital stock from $25 to $5 a share, so that all investments in oil and gas leases may be carried on the company's books at $1 and the item of depletion eliminated from the profit and loss account. The change in par value reduces the capital from $56,469,475 to $11,293,895. The difference of $45,175,580 will be transferred to surplus, against which will be charged the book values of all investments in oil and gas leases, approximately $20,000,000.

Stockholders also voted to reclassify the company's stock into one class of common instead of the present two classes.

Washington Oil

Washington Oil Co. has declared a dividend of 25 cents per share, payable March 19 to stock of record March 15. Previously the company paid 75 cents per share quarterly.

Twenty Representative Stocks

The Oil and Gas Journal's weekly average price of 20 representative petroleum stocks listed on the New York Stock Exchange and New York Curb, based on closing quotations for Wednesday, was as follows:

Sept. 16	18.30	Dec. 23	12.06
Sept. 23	17.64	Dec. 30	21.31
Sept. 30	15.83	Jan. 6	12.69
Oct. 7	15.83	Jan. 13	13.62
Oct. 14	16.43	Jan. 20	13.14
Oct. 21	17.58	Jan. 27	12.79
Oct. 28	16.80	Feb. 3	13.19
Nov. 4	18.86	Feb. 10	12.02
Nov. 11	18.76	Feb. 17	13.28
Nov. 18	17.60	Feb. 24	13.45
Nov. 25	16.68	Mar. 2	13.61
Dec. 2	16.09	Mar. 9	14.38
Dec. 9	15.38	Mar. 16	13.00
Dec. 16	12.60	Mar. 23	13.02

Consolidated Royalty Oil

Consolidated Royalty Oil has declared a quarterly dividend of 5 cents per share, payable April 25, 1932, to stockholders of record of April 15.

Oklahoma Natural

At the annual meeting of directors of the Oklahoma Natural Gas Corp. held in Tulsa on March 25, E. A. Olsen was elected president; Robert W. Hendee, Frank B. Long and B. F. Pickard and W. P. Canavan were elected vice presidents, and W. K. Cottrell, secretary and treasurer; F. W. Peters, assistant treasurer, and W. L. Rinaman, assistant secretary.

The board of directors consists of E.

INDEPENDENT OILS ON NEW YORK CURB

Quotations Compiled by Francis, Bro. & Co., Associate Members of New York Curb, Kennedy Building, Tulsa, Okla.

(Complete record week ended March 19)

Stocks—		Outstanding capital	Par value	Div. rate	Payable or last paid	1929 High	1929 Low	1930 High	1930 Low	1931 High	1931 Low	1932 High	1932 Low	Week ended Mar. 19 Sales	Week ended Mar. 19 High	Week ended Mar. 19 Low	Close Mar. 23
American Maracaibo	(sh)	700,000	N.P.	....	.....	8⅝	1⅛	4½	½	1¾	¼	½	¼	600	¾	¼	..
Arkansas Natural Gas	(sh)	4,084,235	N.P.	....	.....	26	3¾	16¾	4⅝	6½	1⅞	2¾	2	800	2⅛	2	1⅞
Arkansas Natural Gas "A"	(sh)	3,522,521	N.P.	....	.....	24¾	6½	16⅝	4⅝	6¾	1⅞	2⅝	1⅞	7,000	2⅛	1⅞	1¾
Arkansas Natural Gas pfd.	(sh)	2,193,000	$10	15cQ	4- 1-32	9	4	8⅛	6¼	7	3⅞	5½	4⅝	500	5	5	4⅞
British American Oil Corp.	(sh)	2,622,642	N.P.	20cQ	4- 1-32	62	7⅞	23	13⅜	16⅞	6¼	9¾	8½	100	9⅝	9⅝	..
Carib Syndicate		$131,250	25c	....	.....	4⅞	1	2¾	⅝	2⅜	¼	⅝	¼	No sales	..	..	..
Cities Service	(sh)	24,290,359	N.P.	30cA§	5- 2-32	68⅛	20	44¼	13	20¾	5	6⅞	5¼	50,600	6⅛	5¾	5½
Cities Service pfd.	(sh)	1,500,000	N.P.	50cM	5- 2-32	98¾	84	93⅞	78¼	84¾	35⅜	53⅜	44¼	2,400	53⅛	51⅝	51
Columbia Oil & Gasoline v.t.c.	(sh)	$2,000,000	$1	....	.....	2	½	¾	⅛	½	⅛	1⅞	1	1,800	1¼	1	..
Colombia Syndicate		3,250,000	N.P.	....	.....	..	..	21	3⅜	7⅛	1	⅛	⅛	No sales	..	..	..
Colon Oil	(sh)	2,200,000	N.P.	....	.....	15	3⅞	8¼	1⅛	3⅛	¼	⅝	⅛	No sales	..	..	..
Consolidated Oil Corp. w.i.	(sh)	14,190,000	N.P.	....	.....	..	..	..	..	..	..	7	5⅝	9,800	6⅝	6	6¼
Consolidated Royal		$5,527,875	$10	5cQ	1-25-32	11⅛	2½	5⅞	2	2¾	1	1	1	No sales	..	..	..
Cosden Oil	(sh)	323,950	N.P.	....	.....	135	42	74¾	1¼	3¾	⅜	1	½	1,700	¾	½	..
Darby Ptroleum		1,019,392	N.P.	....	10-15-30	26	6½	21¾	4¼	5	1¾	2⅛	1½	700	2⅛	2	2⅛
Derby Oil & Refining	(sh)	500,000	N.P.	....	.....	11	2	11	2	6	1½	2⅛	1½	400	1⅞	1¾	..
Derby Oil & Refining pfd.		48,500	N.P.	....	.....	44	20¾	60	30	40⅛	25	24½	20	50	21¾	21¾	..
Gulf Oil Corp.	(sh)	4,504,921	$25	....	10- 1-31	209	115	166⅞	58½	75½	25⅜	32¼	25⅜	7,800	31⅞	26½	29¾
Indian Terr. Oil "B"	(sh)	7,090,037	N.P.	....	.....	..	..	53½	12⅝	16⅞	5	4½	3⅞	200	3⅞	3⅞	..
Intercontinental Petroleum		$5,682,000	$5	....	.....	2⅞	⅜	1¾	⅜	⅝	⅛	¼	⅛	1,300	⅛	⅛	..
Kirby Petroleum	(sh)	750,000	N.P.	....	.....	3⅝	1¼	3	⅞	1⅞	¼	⅝	⅜	900	⅝	⅜	⅝
Leonard Oil & Development		$50,000,000	$25	....	.....	14⅞	2½	5	¾	2	½	⅞	⅛	3,400	⅛	¼	..
La. Land & Exp.	(sh)	3,000,000	N.P.	....	.....	6⅛	1	4⅜	½	1½	¼	¾	½	6,100	½	½	..
Lion Oil & Refining	(sh)	250,000	N.P.	....	10-27-30	38⅞	18	29	4⅞	6¾	1½	2¼	1⅝	No sales	..	..	..
Lone Star Gas	(sh)	5,000,000	N.P.	15cQ	3-31-32	67⅞	28	55⅞	19⅝	25	5½	9¼	6⅜	1,700	6⅞	6⅜	6⅜
Magdalena Syndicate	(sh)	850,000	$1	....	.....	1¼	½	½	⅛	½	¼	⅛	⅛	35,800	⅛	⅛	⅛
Margay Oil Corp.		160,000	N.P.	25cQ	4-11-32	38½	14	16	3	5	1⅞	6¼	3¾	100	6	6	..
Memphis Natural Gas	(sh)	920,000	N.P.	15cQ	4-15-32	24	8⅛	22¼	7½	12⅛	4½	5¼	4½	200	4⅝	4½	4
Mexico-Ohio Oil Co.		500,000	N.P.	....	.....	6⅜	2¼	7½	1¾	4⅞	1½	2	2	No sales	..	..	..
Mountain & Gulf		$4,000,000	$1	....	4-15-31	1½	½	¾	⅜	½	⅛	⅛	⅛	300	⅛	⅛	..
Mountain Producers		$1,682,182	$10	20cQ	4- 1-32	22⅞	7	12⅛	3¾	5⅞	2	3	2¼	500	2⅞	2⅝	2⅝
National Fuel Gas	(sh)	3,810,183	N.P.	25cQ	4-15-32	43⅞	23	41⅜	19⅜	26½	9⅜	13½	11	900	12½	12¼	12½
New Bradford Oil		$1,095,291	$5	....	4-15-31	5	2½	3½	1⅛	1½	½	¾	⅜	100	⅝	⅝	½
New Mexico and Arizona		$1,000,000	$1	....	.....	9⅜	2¼	7¼	1½	3	⅝	⅞	½	600	¾	¾	¾
North Central Texas	(sh)	400,000	N.P.	....	9- 2-30	18½	6⅛	11¼	2⅛	3¼	⅝	1	⅝	No sales	..	..	..
North European Oil	(sh)	1,372,391	N.P.	....	.....	..	..	6¼	⅝	2⅛	¼	¾	¼	600	¼	¼	..
Pacific Western Oil	(sh)	1,000,000	N.P.	....	.....	26⅝	12⅛	19½	5½	15	2⅞	6¼	4⅛	500	4⅜	4¼	4⅛
Pandem	(sh)	489,875	N.P.	....	.....	3½	½	2½	¼	½	⅛	⅛	⅛	No sales	..	..	..
Pantapec Oil	(sh)	1,506,000	N.P.	....	.....	10½	1⅞	4⅜	⅞	2	⅜	½	¼	No sales	..	..	..
Plymouth Oil	(sh)	1,050,000	$5	25cQ	4- 1-32	37	22	27½	16¼	19	6	7½	6¼	200	7⅛	7⅛	..
Reiter-Foster	(sh)	388,584	N.P.	....	12- 2-29	8½	1⅛	5⅜	1	3⅛	¼	½	⅜	500	½	½	..
Richfield Oil pfd. x.w.	(sh)	399,950	$25	....	.....	31½	22	23½	6½	11	¼	1	½	No sales	..	..	..
Ryan Consolidated	(sh)	500,000	N.P.	....	.....	11	2	8⅝	2	3	⅝	1	¾	500	⅞	¾	..
Salt Creek Consolidated	(sh)	1,286,300	$10	....	4- 1-31	5⅞	1⅞	2½	½	1⅜	⅛	⅜	⅛	No sales	..	..	..
Salt Creek Producers	(sh)	1,496,859	$10	25c	2- 1-32	25⅞	9	15¼	5¼	7¾	2¾	4⅛	3⅛	800	4	3⅜	3⅞
Sunray Oil	(sh)	1,163,185	$5	....	4-15-31	12	5⅝	10	2	5¼	⅛	⅜	7/16	5,900	7/16	⅜	7/16
Texon Oil & Land	(sh)	936,036	N.P.	25c	3-31-32	23	7⅛	19½	8	12⅞	2½	6⅝	5½	100	6	6	..
Venezuelan Petroleum	(sh)	755,090	$5	....	2-15-30	6½	1¾	4½	⅜	1⅞	⅛	½	5/16	600	⅜	⅜	5/16
Woodley Petroleum		$500,000	$1	....	3-31-29	9½	2	5	½	3½	1⅛	2	1⅛	100	2	2	..
Y Oil & Gas		100,000	N.P.	....	.....	2⅞	½	2½	⅜	2¼	⅛	½	⅛	1,600	⅜	⅛	5/16

•Ex-dividend. †Unit of trading less than 100 shares. ‡Payable monthly and monthly stock dividend of one-half per cent. §Paid in lieu of regular cash dividend of 2 per cent.

A. Olsen, Frank B. Long, B. F. Pickard, W. K. Cottrell, F. E. Kistler, R. C. Allen and Edwin D. Steel. The executive committee is made up of Messrs. Olsen, Kistler, and Hendee and the finance committee, Messrs. Kistler, Olsen and Cottrell.

WEST TEXAS GAS HEARINGS

AUSTIN, Tex., Mar. 28.—The Railroad Commission will hold four hearings in West Texas soon on appeals of natural gas companies from city ordinances ordering reductions in rates. The reductions are suspended, under bond given by the companies, pending the hearings.

Members of the commission will hold a hearing at Throckmorton, April 4, on appeal of the Throckmorton Gas Co.

A hearing will be held at Childress April 6 on appeal of the North Texas Gas Co. Another will be at Hedley, April 9, on appeal of the City Gas Co., and the fourth at Perryton on appeal of the gas company serving that city. Each will involve the gas rates of the city where the hearing is held.

STANDARD OIL STOCKS ON NEW YORK CURB

Quotations Compiled by Francis, Bro. & Co., Associate Members of New York Curb, Kennedy Building, Tulsa, Okla.

(Complete record week ended March 19)

1932 High	1932 Low	Week ended Mar. 19 Sales	Week ended Mar. 19 High	Week ended Mar. 19 Low	Close Mar. 23	Stocks—		Outstanding capital	Par value	Div. rate	Payable or last paid	1929 High	1929 Low	1930 High	1930 Low	1931 High	1931 Low
..	..	No sales	..	..	..	Atlantic Lobos		499,448	N.P.	....	5-28-30	..	..	1	¼	1	⅛
6¼	6	100	6	6	..	Borne Scrymser		$1,000,000	$25	....	10-15-30	46½	25	25	11¼	16	6
35	30¼	100	34	34	..	Buckeye Pipe Line		$10,000,000	$50	$1Q	3-15-32	74½	55	69	39⅞	56	30
90	75	100	85½	85½	..	Chesebrough Mfg.		$3,000,000	$25	$1Q‡	3-31-32	210	130	184⅞	104¼	129½	75
2⅜	1¾	300	2¼	2⅛	2⅛	Creole Petroleum	(sh)	5,977,872	N.P.	....	.....	11¾	5⅜	7⅞	3	3⅞	1⅝
32	23	No sales	..	..	..	Eureka Pipe Line		$5,000,000	$100	$1Q	2- 1-32	70½	40	54¾	26	36	19
49	42⅜	1,000	46½	44⅛	44	Humble Oil & Refining		$74,103,300	$25	50cQ	4- 1-32	128	74⅛	119	57¼	72	44¼
9½	7⅝	1,800	9⅛	8½	..	Imperial Oil of Canada	(sh)	25,421,768	N.P.	12½cQ	3- 1-32	41	22	30	15	18¼	7⅜
7½	5	1,400	7½	5	..	Indiana Pipe Line (new)		$3,000,000	$10	25cQ	2-15-32	41⅞	26	41	14½	21⅛	5½
10½	8¾	12,300	10¼	9⅞	9⅞	International Petroleum (new)	(sh)	14,247,088	N.P.	25cQ	3-15-32	30⅜	15	24	11⅜	15½	7⅜
10½	6⅞	600	10½	10	..	National Transit		$6,362,500	$12.50	25cQ	4-15-32	25⅛	10⅛	22⅜	11½	17½	5
4	3	No sales	..	..	3¾	New York Transit		$500,000	$5	10cQ	4-15-32	17½	10	21⅜	10⅛	14½	5⅞
4¾	3¾	500	4¼	4	..	Northern Pipe Line		$2,000,000	$50	$2SA	1- 2-32	63	41	54	26¼	35½	20
6⅜	5	300	6	5	..	Penn Mex Fuel		$10,000,000	$25	50c	10-31-31	44½	20	32	12	15½	5½
14½	9⅝	200	12	12	..	South Penn Oil		$30,000,000	$25	25cQ	3-31-32	60¼	35⅛	45⅞	16⅛	23⅞	9¼
10	8	No sales	..	..	..	Southern Pipe Line		$1,000,000	$10	50cQ	3- 1-32	22½	13	20⅞	8⅜	17	7
37	32	No sales	..	..	..	Southwest Pennsylvania Pipe Line		$1,750,000	$50	$1Q	4- 1-32	70	60	64	32	42½	25
17¼	14	12,300	16⅞	16	15⅞	Standard Oil of Indiana		$348,175,069	$25	25cQ	3-15-32	63	45	59⅞	30	38½	13½
15⅞	12	3,000	14¾	14¼	..	Standard Oil of Kentucky		$25,654,516	$10	40cQ	3-31-32	46⅞	29	40½	18⅝	23⅝	12⅛
19	15¾	200	18¼	17½	..	Standard Oil of Nebraska		$4,649,225	$25	50cQ	3-21-32	50¼	40	48⅞	34⅝	36½	16
28⅛	23¾	150	26	24	..	Standard Oil of Ohio		$14,000,000	$25	62½cQ	4- 1-32	129	60	108½	43¼	62½	23
..	..	No sales	..	..	..	Swan-Finch Co.	(sh)	34,480	$25	....	1-15-29	18	10	10	4	4½	1

*Ex-dividend. †Unit of trading less than 100 shares. ‡Plus 50 cents extra.

TRANSACTIONS IN OIL SHARES ON NEW YORK STOCK EXCHANGE

Quotations Compiled by Francis, Bro. & Co., Members of the New York Stock Exchange and Associate Members of New York Curb, Kennedy Building, Tulsa, Okla.

(Complete record week ended March 19)

1932 High	1932 Low	Week ended Mar. 19 Sales	Week ended Mar. 19 High	Week ended Mar. 19 Low	Close Mar. 23	Stocks—		Outstanding capital	Par value	Div. rate	Payable or last paid	1929 High	1929 Low	1930 High	1930 Low	1931 High	1931 Low
14¾	12	1,500	14½	15	..	Amerada Corp.	(sh)	922,075	P.N.	50cQ	1-30-32	42⅝	17½	31½	16½	23	11¼
4	½	2,700	2⅛	½	..	American Republics Corp.	(sh)	209,180	N.P.	....	12-31-30	64¾	12½	37	5⅛	12⅜	1¼
9¾	7¼	320	9	8	..	Associated Oil		$57,260,300	$25	....	6-30-31	47¼	34½	51	30	31	8¾
12⅞	8⅝	8,500	11¾	10¾	11	Atlantic Refining		$67,416,050	$25	25cQ	3-15-32	77⅞	30	51⅜	16⅝	23⅝	8⅝
5⅞	4	6,900	4¾	4¼	4⅛	Barnsdall Corp. A		$56,546,600	$25	....	5-11-31	49⅛	20	34	8⅝	14½	4
16¼	11⅞	41,000	14¾	13½	13¾	Columbia Gas & El.	(sh)	11,684,220	N.P.	37½cQ	2-15-32	140	52	87	30⅝	45⅝	11⅝
10½	9	300	10¼	10	..	Colonial Beacon Oil	(sh)	1,444,970	N.P.	....	12-22-22	32⅞	12½	20⅜	8¾	10½	7½
7	5⅝	11,500	6⅜	6	6¼	Continental Oil of Delaware	(sh)	4,741,554	N.P.	....	12-15-27	47⅞	18	30½	7¾	12	5
35¾	28	6,200	33⅜	31	32	General American Tank Car	(sh)	811,647	N.P.	$1Q	1- 1-32	123¾	75	111⅞	53⅛	73⅛	28
15½	11	1,900	12½	11½	11¾	General Asphalt	(sh)	413,333	N.P.	25cQ	3-15-32	94¾	42¼	71½	22⅜	47	9⅝
24⅜	16⅛	5,000	21½	19⅛	19¾	Houston Oil		$24,968,600	$100	....	10-17-30	109	26	116⅞	29¼	68½	15¾
1⅝	1¼	100	1¼	1¼	1½	Indian Refining		$12,564,070	$10	....	10- 1-30	53	13⅛	17	2	4⅝	1⅛
1⅜	1	200	1¼	1¼	..	Louisiana Oil Refining	(sh)	1,190,063	N.P.	....	.....	18	7	12	3½	4½	1
1	⅝	400	1	¾	⅝	Maracaibo Oil	(sh)	330,000	N.P.	....	.....	18½	5⅛	10⅜	1⅜	3¾	½
6½	5¼	2,100	5¾	5⅜	..	Mid-Continent Petroleum	(sh)	1,857,912	N.P.	....	2-16-31	39⅞	22⅛	32	11	16¾	5
9¼	6	500	8	8	..	National Supply of Delaware	(sh)	390,879	$50	....	5-15-31	144	98½	124¾	60	70¼	5
7⅜	5	14,900	6⅞	6¼	6⅝	Ohio Oil	(sh)	6,648,052	N.P.	....	3-14-31	79⅞	64¼	32	16	19½	5⅛
17⅛	17⅛	300	17⅛	17⅛	..	Pan American P. & T.		$50,084,700	$50	40c	4-20-32	69	40½	46½	42	35⅛	20
19	16	No sales	..	..	..	Pan American P. & T. "B"		$121,110,650	$50	40c	4-20-32	69¼	40½	67¼	30	36½	18
1¼	½	100	1	1	..	Panhandle P. & R.	(sh)	199,370	N.P.	....	.....	15¼	3	12¾	1⅜	4¼	⅝
6½	4	14,100	6	5⅛	5⅜	Phillips Petroleum	(sh)	2,593,075	N.P.	....	1- 2-31	47	24¼	44⅝	11½	16⅝	4
½	¼	1,400	½	⅝	..	Pierce Oil Corp.		$29,622,831	$25	....	.....	3⅜	1	2½	½	1½	¼
1⅛	⅝	2,200	1	⅞	..	Pierce Petroleum	(sh)	2,500,000	N.P.	....	2-16-31	5⅞	½	7⅛	1⅛	3⅜	½
7⅛	4½	1,600	6¼	5¾	6⅛	Prairie Oil & Gas		$60,848,000	$25	....	3-31-31	65⅜	40½	54	11¼	20⅜	4⅛
9¾	6⅛	7,800	9	8	8⅜	Prairie Pipe Line		$101,250,000	$25	....	6-30-31	65	45	60	16⅝	26½	5⅞
1⅝	1	300	1¼	1⅛	..	Producers & Refiners		$37,438,950	$50	..	9-15-23	25⅞	4	11⅞	1	6	1
9	3⅛	10	8¼	8¼	..	Producers & Refiners pfd.		$2,845,350	$50	....	5- 4-25	46¾	25½	40	11½	16	3
5⅛	3⅞	2,200	4¾	4⅜	4⅝	Pure Oil		$75,959,250	$25	....	9- 1-30	30¾	20	27¼	7⅝	11⅞	3¼
¾	½	700	¾	⅝	⅝	Richfield Oil (new)		$52,410,875	N.P.	....	.....	49⅝	20	9¾	4⅛	6⅜	⅝
2½	2	2,600	2½	2⅛	2⅜	Rio Grande Oil	(sh)	1,236,270	N.P.	....	7-25-30	42½	15	25¾	5	10¼	1¼
23	13⅜	6,400	19¾	17½	16¼	Royal Dutch N. Y.	(sh)	611,303	....	$0.9385	8- 4-31	64	43⅛	56½	36⅞	42⅝	13
9⅞	6¾	12,100	8¾	7⅞	8⅜	Seaboard Oil of Delaware	(sh)	1,244,383	N.P.	....	10- 1-24	59⅜	8¼	37	9¾	20¾	5½
15¾	8½	No sales	..	..	..	Shell Transport & Trading Co.		£23,985,000	£1	$0.726	7-23-31	51½	40⅝	48⅜	26	34	5
4¼	2¾	2,300	3⅞	3½	3½	Shell Union Oil	(sh)	13,066,497	N.P.	....	6-30-30	31¾	19	25½	5¼	10¼	2½
31	19	1,900	27	25	..	Shell Union Oil pfd.	(sh)	400,000	$100	....	7- 1-31	108¼	93	106¼	55	78	15
6	4⅜	3,400	5¼	4⅜	4¾	Simms Petroleum		$8,353,620	$20	....	9-15-30	40⅛	15	37	5⅝	11	3½
7⅛	4¼	36,000	6⅝	5⅝	5⅞	Sinclair Consolidated	(sh)	5,500,000	N.P.	....	4-15-31	45	21	32	9¾	15⅞	4⅛
92	79	2,100	89	86	92	Sinclair Consolidated pfd.		$16,025,250	$100	$2Q	2-15-32	111	103	112¼	86	103	64
4½	2½	1,300	4	3½	..	Skelly Oil		$27,441,250	$25	....	12-15-30	40½	28	12	10⅛	12⅞	2
19	12	300	18¾	18¼	..	Skelly Oil pfd.	(sh)	119,800	$100	....	5- 1-31	..	..	99¾	42	62	10
10¾	8¾	22,800	10⅛	9½	9½	Socony-Vacuum	(sh)	31,923,072	$25	25c	3-15-32	..	..	106⅜	98	106	87⅛
91½	84¾	700	90¼	90	89⅞	Standard Oil Export pfd.	(sh)	764,885	$100	$2.50SA.	12-31-31	..	..	..	..	21	8⅜
27¼	22½	9,100	26	25	24⅞	Standard of California	(sh)	12,594,098	N.P.	50cQ	3-15-32	81⅞	51½	75	42½	51¾	23⅛
12⅜	8⅛	200	8½	8⅛	..	Standard of Kansas		$8,000,000	$25	....	3-16-31	33¾	18	49	14⅜	19	7¾
31½	25⅜	27,400	29⅞	28⅜	28⅞	Standard Oil of New Jersey		$634,999,200	$25	25cQ§	3-15-32	83	49	84⅞	32½	52½	26
32	27⅜	200	30½	30	..	Sun Oil	(sh)	1,416,869	N.P.	25cQ	3-15-32	68⅜	55	70	39	45¼	26¾
⅝	¼	1,600	⅜	¼	..	Superior Oil Corp.	(sh)	766,979	N.P.	....	12-20-30	24	5¼	9⅜	¾	1¾	¼
13⅞	10	18,800	12⅜	11½	11⅜	The Texas Corporation		$246,204,900	$25	25cQ	4- 1-32	71⅞	50	60½	28¼	36¼	9⅞
2⅜	1⅞	400	2⅛	2	2	Texas Pacific Coal & Oil Co.		$9,304,890	$10	....	12-31-29	23⅞	9½	14½	4	6½	1⅞
9	7½	600	9	7½	..	Tide Water Oil	(sh)	2,191,759	N.P.	25cQ	3-31-32	40	14	31	13	18	9⅞
41	30	600	40	37½	..	Tide Water Oil pfd.	(sh)	19,947,000	N.P.	$1.25Q	2-15-32	97½	85⅛	94⅞	71	83	30
3½	2¼	20,800	2⅜	2¼	2⅜	Tide Water Associated	(sh)	5,560,424	N.P.	....	2-16-31	23½	10	17¾	5⅞	9	2⅛
28⅛	20	1,100	28¼	26¼	26¼	Tide Water Associated pfd.		$73,284,500	....	$1.50Q	1- 2-32	90⅞	74⅛	89¾	55	68	20½
13⅞	10¾	2,000	13⅛	12½	12⅝	Union Oil of California		$104,342,375	$25	35cQ	2-10-32	57	42⅛	50	10⅛	26⅝	11
19¼	15	500	17½	15	..	Union Tank Car	(sh)	1,254,048	$100	40cQ	3- 1-32	163¾	121⅞	38½	23	25⅛	16
1½	1	100	1¼	1¼	..	Warner-Quinlan	(sh)	632,948	N.P.	....	7- 1-30	42⅞	15	27	4¼	7⅜	⅞
5¾	3¼	1,800	4⅞	4¼	..	Wilcox Oil & Gas	(sh)	428,907	$5	....	5-10-28	29¾	12⅞	21	6½	9⅜	2¾

*Ex-dividend. †Unit of trading less than 100 shares. ‡Plus extra dividend of 25 cents.

In comparing highs and lows for the several years in the three tables, it will be necessary to take into consideration cases where there have been stock split-ups.

"CRITICAL PRODUCTION" IS NEW OIL TERM

(Continued from Page 20)

Care was used in checking sections actually recovered and in accounting for missing portions of the core all available data were considered.

To obtain still further information upon which an estimate of recoverable oil could be based three cross sections of the field were prepared. They were drawn to scale and covered the Longview, or northern area, the Kilgore, or central portion of the field, and the Henderson, or southern end of the field. The sections had for base lines the top of the Georgetown lime and for top line the extension of a line conforming to a point 75 feet above the Georgetown in a sandy shale at the eastern side of the field.

Sections Wedge-Shaped

These sections were wedge-shaped and the water lines were shown crossing these triangles in a horizontal position. These lines of contact between top of the water and the producing horizon were 20,000 feet long in the Longview area, 10,000 feet long in Kilgore and 19,000 feet long in Henderson area, and the total productive area in contact with water is therefore estimated at 58,000 acres out of the 100,000 acres in the field, or 58 per cent.

From these cross sections other estimates of sand thickness were prepared and they were 24 feet for Longview, 15.4 feet for Kilgore and Henderson 16.4 feet or an average of 18.5 feet of saturated sand for the entire field. These two methods of estimating saturated sand thickness place the recoverable oil at about 13,000 bbls. per acre or about 1,400,000,000 bbls. for the field.

In his paper Mr. Cheney used isopach maps to show the approximate thickness and distribution of five groups of beds ranging from Trinity (Comanche) to Mount Selman (Eocene) in age. The record shows a crustal oscillation in the following sequence: (1) extensive subsidence during Trinity time centering in the region of the present Sabine uplift; (2) more uniform subsidence during Fredericksburg and Washita time; (3) development of a localized basin of Woodbine-Eagle Ford time in the western part of Northeast Texas accompanied by active folding, upwarping, and volcanic activity on the east and northeast; (4) a post-Eagle Ford trough of upper Cretaceous age west of the East Texas Field; (5) subsidence during Eocene of areas surrounding the present Sabine uplift region, contributing to its present structural form. The occurrence of oil seems to be related more to the early than to the present structural conditions.

Bottom Hole Pressures

During the Friday afternoon session C. V. Millikan, chief engineer for the Amerada Petroleum Corp., Tulsa, gave a paper on the "Value of Bottom-Hole Pressures in Geological Interpretations." Mr. Millikan defined bottom-hole pressure as "the pressure taken at the bottom of a well at or near some porous horizon." The interpretations to be placed upon such data are variable but they may have many uses and as more readings are made available and further study given to them many new uses will be developed.

It may be possible to use bottom-hole pressures to determine rate of recovery. The origin of hydrocarbons will have some bearing and influence on bottom-hole pressures. Compactions of beds will have some effect, but only where actual subsidence has taken place will overburden have much effect upon the amount of bottom-hole pressure in wells. Hydraulic head in influencing bottom-hole pressure has probably been given more credit than it is entitled to.

Mr. Millikan outlined some practical uses for bottom-hole readings in drilling wells and cited applications of results obtained in the Seminole area to recent wells drilled there. An explanation of the reason why rotary muds penetrated lower formations in Seminole wells was that the pressure exerted by the mud column was several hundred pounds greater than the bottom-hole pressure in the producing horizon. This necessitated the use of cable tools for drilling in.

Continuity of reservoirs may be determined better by bottom-hole pressure than by lithology because the actual section recovered in coring or by sampling is a small part of the acreage drained by the well. The rate of decline of pressure in gas reservoirs has been used as a basis for calculating reserves and it is possible that similar methods may be used in the future to determine oil reserves. In such calculations the gas in the oil will have a decided effect but data are now being assembled to give relationship to oil reserve in natural reservoirs and when this work is completed it may be possible to estimate future recoverable oil in pools quite accurately by use of bottom-hole pressure measurements.

Mr. Millikan showed several curves of East Texas production and pointed out the variable character of wells in that area. Much is being learned about the field by a detailed study of bottom-hole pressures taken by several of the major companies and exchanged by them and correlated to make maps of the regions of equal pressure throughout the district.

Bartlesville and East Texas

W. R. Snow, geologist for the Barnsdall Oil Co., Tulsa, gave a paper on the history of water encroachment in the Bartlesville sand fields of northeastern Oklahoma and emphasized the fact that there has not been any water drive in any of these fields which would help to increase recovery from the sand either by flushing or by maintaining the reservoir pressure. It is believed that the absence of such water encroachment has caused the ultimate recovery of these sand bodies to be much less than would have resulted under an effective water drive.

Mr. Snow showed cross sections of the Bartlesville sand area and also of the Woodbine sands of Texas and pointed out the difference in the relative position of the oil sands to water in these two areas. The water is under a hydrostatic head in East Texas which is not the case in Oklahoma. The average recovery to date from Bartlesville sands in northeastern Oklahoma has been about 8,500 bbls. The area is about the same in size as that of East Texas, and therefore was used as a basis for comparison. Gas has been the only expulsive force available in the Bartlesville sands while recently obtained bottom-hole pressure readings in East Texas indicate that a water drive is now becoming effective there which will aid the gas energy and gravity in expelling oil from the reservoir into the wells.

These recent bottom-hole pressure readings show that the pressures are building up over large areas in contrast with steady declines registered until recently. It is reasoned from these data that the rate of withdrawal has been so regulated in East Texas up to date as to allow water to move into the formation at a uniform rate and therefore to be effective in building up reservoir pressures now that differential pressure areas have been established through removal of over 125,000,000 bbls. of oil. If the withdrawal rate is maintained the water drive will be effective, but it is not expected that the field can produce profitably at a much greater rate than it is now doing if water movement is to be controlled. This will effectively limit the daily rate of production regardless of the number of wells drilled.

Many Phases of Geology Discussed

There were just 100 papers scheduled for presentation before the various technical sessions at this meeting. There was a disposition throughout to deal with the economic aspects of applied geology rather than with strictly geological subjects.

It was interesting to note that the geologist is considering the engineering side of producing oil in his study of prospective and developed oil fields. This tendency, as pointed out by Mr. Garrett, deals with "critical production" as against "potential production" so much stressed in the past. Future fields will be more difficult to find and for that reason it was the opinion of many geologists that search for them should be started at once because the time interval between now and their discovery may be of appreciable importance to the industry.

Stocks above ground and in underground reservoirs are being depleted and if new reserves are not developed within a reasonable time there may be a period of shortage when oil available to the refineries will not be sufficient to meet their current demands which would tend to inflate prices.

Miscellaneous Papers

M. G. Cheney, consulting geologist, Coleman, Tex., delivered a paper on "The Concho Divide" in Texas prepared in conjunction with Sidney L. Harris. This paper discussed conditions shown by north-south and east-west cross sections and maps contoured on the surfaces of the pre-Mississippian, and the Strawn beds. Isopach lines showing thickness of beds between these two datum planes reveal the Concho divide of Central Texas as a dominating feature in the Bend and earlier beds of this region. The study reveals possibilities of undiscovered pools in Southwest Texas.

Other papers on Texas geology were presented as well as notes on conditions in Mississippi and the igneous rocks of central Mississippi embayment area.

R. L. Clifton, Enid, Okla., presented a paper on "Geology and Gas-Oil Ratios in the Oklahoma City Field," in which he pointed out that the gas-oil ratio of the producing oil wells and the relation of such ratios to geology or to natural factors, and to operating methods or to artificial factors, are in the dual aspect of geology and of economics. The gas-oil ratios of the field present a definite index to problems of water-intrusion and to ultimate recovery of oil and gas.

"Sands and Limes of Wyoming" was discussed by John G. Bartram of Denver, Colo., and Max W. Ball, also of Denver, gave a review of the work done in the Athabaska oil sands areas of Alberta, Canada. Mr. Ball stated that these sands cover an area 10,000 square miles to an average thickness of 50 feet and are saturated about 15 per cent, making total oil reserves of about 250,000,000,000 bbls. of oil.

United States Best Source of Helium

A study of natural gas other than the hydrocarbons was given in brief form by C. E. Dobbin, Denver, in which he pointed out that the only natural gas fields in the world that yield gas sufficiently rich in helium to justify extraction of the element on a commercial scale occur in the United States. Rich helium and nitrogen gas occur in several fields in southeastern Kansas, southern Ohio, southeastern Colorado, the Texas Panhandle and eastern Utah. Natural gases rich in carbon dioxide are largely confined to the western part of the United States and the Panuco district, Mexico. Gases rich in hydrogen sulphide are produced in many areas, especially in the Permian

CALIFORNIA CRUDE OIL PRICES

(Continued from Page 147)

Wheeler Ridge—55 cents per barrel for all grades (14° to 25.9°).
Coalinga—55 cents for all grades from 14° to 24-24.9°; 57 cents for 25 gravity.
Newhall, McKittrick and Kern River—55 cents for all grades (14° to 19.9°).
Montebello—65 cents for all grades (14° to 25.9°).
Whittier and LaHabra—65 cents for all grades (14° to 22.9°).
Elwood Terrace, f.o.b. ship—32° to 33.9°, 79 cents; 34° to 34.9°, 81 cents; 35° to 35.9°, 84 cents; 36° and above, 87 cents.
Playa Del Rey—Prices subject to field gathering charge of 5 cents per barrel—19° to 19.9°, 65 cents; 20° to 20.9°, 65 cents; 21° to 21.9°, 66 cents; 22° to 22.9°, 67 cents; 23° to 23.9°, 68 cents; 24° to 24.9°, 67 cents; 25° and above, 68 cents.

ASSOCIATED OIL CO. PRICES

Associated Oil Co. prices effective June 20 are as follows:

Ventura Avenue, 22 gravity, 58 cents, with 2 cents added for each degree upward to and including 30 gravity, which is 74 cents.

Kettleman Hills—The Associated Oil Co., effective at 7 a.m. February 5, 1932, withdrew and canceled any and all prices heretofore published and in effect for Kettleman Hills oil.

Potrero, 24 gravity, 69 cents, with 2 cents added for each degree upward to 34 gravity which is 69 cents.

General Petroleum Co. in Kettleman Hills, effective January 1, 1932: 33-33.9 degrees, 66 cents; 34-34.9 degrees, 68 cents; 35-35.9 degrees, 70 cents; 36-36.9 degrees, 72 cents; 37-37.9 degrees, 74 cents; 38-38.9 degrees, 76 cents; 39-39.9 degrees, 78 cents.

UNION OIL CO. OF CALIFORNIA

Crude Oil Prices for Its Purchases at the Well for Crude Produced in Strict Accordance With the Production Allocations Made by the California Statewide Curtailment Committee Effective 7 a.m., June 20, 1931
(All gravities above those quoted take highest price for that field)

Gravity °A.P.I.	Signal Hill	Alamitos Heights Seal Beach	Huntington Beach	Athens, Rosecrans, Domingues	Torrance	Santa Fe Springs	Playa Del Rey* E. Coyote	Richfield	Montebello	Santa Paula	Orcutt	Coalinga	Lost Hills	McKittrick, Kern River Sunset-Midway, Elk Hills, Buena Vista Hills	Gravity °A.P.I.
11-13.9	....	....	....	....	....	....	....	....	....	....	....	....	....	$.50	11-13.9
14-14.9	$.65	$.65	$.65	....	$.65	....	....	$.65	$.65	$.65	$.55	$.55	$.55	.55	14-14.9
15-15.9	.65	.65	.65	....	.65	....	....	.65	.65	.65	.55	.55	.55	.55	15-15.9
16-16.9	.65	.65	.65	....	.65	....	....	.65	.65	.65	.55	.55	.55	.55	16-16.9
17-17.9	.65	.65	.65	....	.65	....	....	.65	.65	.65	.55	.55	.55	.55	17-17.9
18-18.9	.65	.65	.65	....	.65	....	....	.65	.65	.65	.55	.55	.55	.55	18-18.9
19-19.9	.65	.65	.65	....	.65	....	$.65	.65	.65	.65	.55	.55	.55	.55	19-19.9
20-20.9	.65	.65	.65	....	.65	....	.65	.65	.65	.65	.56	.55	.55	.55	20-20.9
21-21.9	.65	.65	.65	....	.65	....	.65	.66	.65	.65	.57	.55	.57	.55	21-21.9
22-22.9	.65	.65	.65	....	.66	....	.67	.67	.65	.65	.59	.55	.59	.56	22-22.9
23-23.9	.67	.67	.67	....	.67	....	.68	.68	.65	.65	.61	.55	.60	.58	23-23.9
24-24.9	.69	.69	.69	$.69	.68	$.65	.69	.69	.65	.66	.63	.55	.62	.61	24-24.9
25-25.9	.71	.71	.71	.71	.70	.65	.70	.70	.65	.68	.65	.57	.64	.64	25-25.9
26-26.9	.73	.73	.73	.73	....	.65	....	.72	....	.70	.67	....	.66	.66	26-26.9
27-27.9	.75	.75	.75	.75	....	.68	....	.74	....	.72	....	....	.67	.68	27-27.9
28-28.9	.77	....	....	.77	....	.71	....	....	....	.74	....	....	.69	.71	28-28.9
29-29.9	.79	....	....	.79	....	.73	....	....	....	.76	....	....	.71	.74	29-29.9
30-30.9	.81	....	....	.81	....	.75	....	....	....	.78	....	....	.72	.76	30-30.9
31-31.9	....	....	....	.83	....	.78	....	....	....	....	....	....	....	....	31-31.9
32-32.9	....	....	....	.85	....	.80	....	....	....	....	....	....	....	....	32-32.9
33-33.9	....	....	....	.87	....	.83	....	....	....	....	....	....	....	....	33-33.9
34-34.9	....	....	....	.89	....	.85	....	....	....	....	....	....	....	....	34-34.9

*Subject to a gathering charge of 5 cents per barrel.

fields of western Texas and in the Gulf Coast salt dome belt.

Dr. Eugene A. Stephenson, University of Missouri, Rolla, Mo., read a paper on "Valuation of Natural Gas Properties." Another paper on gas in Somerset and Fayette Counties, Pennsylvania, was presented by Harley S. Gibbs, Pittsburgh, Pa.

Robert M. Whiteside, Shell Petroleum Corp., Tulsa, presented a paper upon "Geologic Interpretations from Rotary Well Cuttings," in two parts, the first dealing with field technique and the second with laboratory practice. These papers outlined the value of accurate sampling of well cuttings and covered the work of Mr. Whiteside and others in the Oklahoma City Field during the past four years.

R. W. Brauchli, Anderson-Prichard Oil Co., Oklahoma City, discussed "Coring in Oklahoma City Field." He stated that approximately 18,000 feet or 0.3 per cent of the total footage drilled in that field had been cored. The average recovery is approximately 54 per cent. The recovery shows a marked increase with increased core diameter and increased diameter of drill pipe. The length of the core and the change of formations influence the recovery little.

Discussions of many foreign oil fields were presented by title only.

The petroleum geophysicists and association geophysicists held special technical sessions at which papers upon these subjects were presented and discussed. The Society of Economic Paleontologists and Mineralogists also held special sessions in the Huckins Hotel and discussed fossils and foraminifera and early plant life.

Urge Adequate Funds

The following resolution was adopted and sent to the chairman of the Committee on Appropriations, United States Senate, Washington, D. C., with copies to Secretary of the Department of the Interior and the director of the United States Geological Survey:

"The American Association of Petroleum Geologists, representing geologists of 43 states, assembled here in annual convention, has heard with regret the proposed reduction of appropriations for the Department of the Interior which presumably affects the Geological Survey. The delegates to this convention are unanimously of the opinion that any reduction of the helpful activities of the Geological Survey during this period of economic stress will be harmful to the proper development of the country's resources. As petroleum geologists, we believe that the unrestricted services of this bureau are essential to the effective development of our natural resources and their wise conservation."

DIESEL-ELECTRIC PLANT INSTALLED ON BARGE

(Continued from Page 22)

One Oilwell rotary table.

One 125-horsepower, 440-volt, 3-phase, 60-cycle, 870 r.p.m., protected type drilling motor.

Two 150-horsepower, 440-volt, 3-phase, 60-cycle, 870 r.p.m., protected type mud-pump motors.

One oil immersed magnetic control unit for the control of the drilling motor.

Two oil immersed manual control units for the operation of the mud pump motors.

Five-inch, 22.2 pounds per foot, drill pipe used to drill to 3,000 feet deep.

Four-inch, 12.75 pounds per foot, drill pipe used to complete the hole to 3,400 feet.

Operation of Equipment

Direction of rotation and speed of operation of the drilling motor is controlled by an eight-point reversing switch connected to the drawworks post by telegraph cords. An auxiliary speed point is provided that can be cut in on any main control point, giving 16 points of speed control in either direction.

For any Diesel electric drilling equipment to be successful it must be possible to operate the entire rig with either generating unit shut down. Of course, this would have to be on a limited basis, within the capacity of the unit in operation.

As this was the first equipment of its kind to be placed in operation, a number of experiments were performed to see what could be accomplished with only one engine.

There were 1,330 feet of 12½-inch casing set with only one engine running, and it would have been possible to run the 3,000-foot string of 5⅝-inch casing with one engine although both engines were used to insure continuity of operation.

When drilling in certain formations there is a tendency for the cuttings to "ball up" and cause a plugged bit. When this occurs it is necessary to raise the pipe, drop it and catch it with the drawworks brake before it reaches bottom, in order to force the plug from the bit. As the mud pump must be operated at the same time that this operation is carried on, a heavy load is imposed upon the generating equipment. It was found possible to perform this task with one engine and one generating unit.

No difficulty whatever was experienced in operating the two generating units in parallel.

The time required and the current drown by the drilling motor for hoisting each stand of 35 stands of pipe is shown on the curve sheet included with the article. The value of current shown is the steady ammeter reading taken after the pipe has been brought up to speed, and does not indicate the torque nor the power required to start the load and accelerate it. It is difficult to read accurately the rapid swings of the ammeter caused by notching of the controller while the load is being accelerated.

The time for hoisting each fourble of 5-inch, 22.2-pound per foot pipe as shown on the curve sheet gives a true indication of the result obtained with the equipment when hoisting pipe.

Cost of Operation

The cost per foot of hole drilled with this equipment is less than one-half that of steam. This lower cost per foot is due to savings in certain items and complete elimination of others. These various items and the manner in which they affect the drilling cost are discussed below:

Lower installation cost due to elimination of boiler foundations and foundations for fuel oil and water tanks.

Less time required for rigging up.

Lower maintenance cost due to elimination of boiler expense.

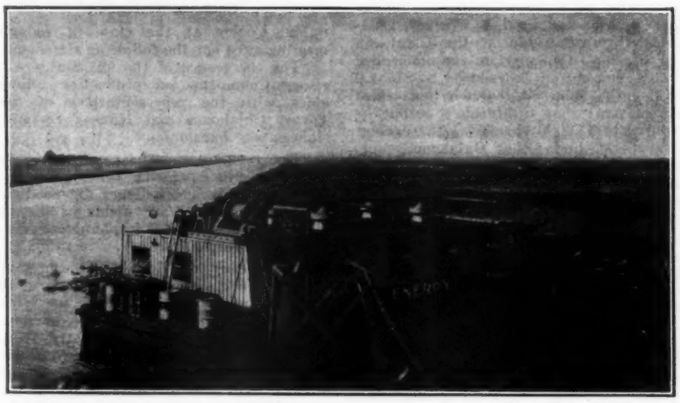
Lower moving cost.

Lower operating cost. The fuel cost is much lower than with the steam equipment. Investigation of the data carefully compiled on the operation of this equipment indicates 4.71 bbls. of fuel oil were used per day. The cooling water for the engine is taken from the bay, so the charge for boiler water for the steam equipment represents a distinct saving with the Diesel electric equipment.

There were 5.34 gallons of lubricating oil used per day by the plant, but this is high as the machinery was new and the oil was changed once unnecessarily. Approximately 3 gallons per day should be required in the future.

Equipment has not been operated a sufficient length of time to determine accurately the cost of repairs, depreciation, etc., but when fair allowances are made for these items the drilling cost, including labor, fuel, repairs, depreciation, etc., is approximately 70 cents per foot, or $58.40 per day.

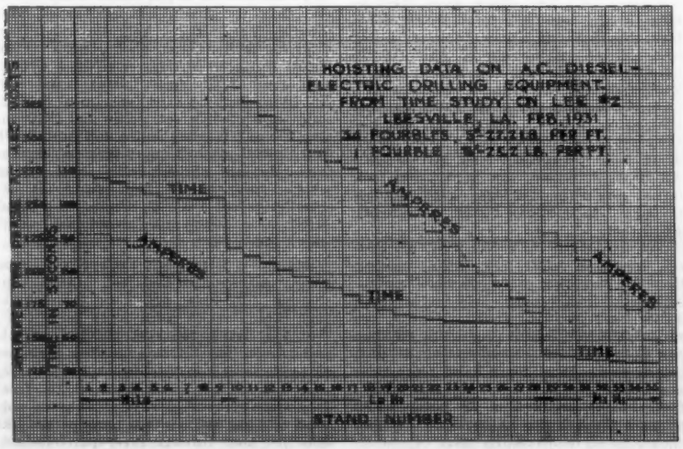
The cost of the barge complete with engines and generators, connecting cable and electrical equipment at the derrick is approximately $80,000.



The barge Energy on location.

Acknowledgment

The writer wishes to acknowledge the assistance of L. K. Laney, consulting engineer of The Texas Company, and H. F. Shepherd, assistant chief engineer of the Cooper-Bessemer Corp., in the preparation of this article.


HOISTING DATA ON A.C. DIESEL-ELECTRIC DRILLING EQUIPMENT
FROM TIME STUDY ON L.S.K. #2
LEESVILLE, LA. FEB. 1931
34 FOURBLES 5" 22.2 LB. PER FT.
1 FOURBLE 5" 22.2 LB. PER FT.
TIME
AMPERES
STAND NUMBER

SHAMROCK POOL DENIED

AUSTIN, Tex., Mar. 28.—The Texas Railroad Commission has denied application of the Shamrock Oil & Gas Co. for designation of the Shamrock or Vander Weide Pool in Moore County as a separate field for Texas Panhandle proration regulations.

Allowable production of the Panhandle area was left unchanged in the order following hearing in which the entire group of conservation rules for the whole Panhandle Field was opened.

The Panhandle production limits and rules will continue in effect, subject to a further possible review at the March 30 general state proration hearing for all fields except the East Texas Field.

CARE IN MAINTAINING AND OPERATING CARS

(Continued from Page 144)

opened automatically by starting the operation of removing the manhole cover shall be provided." To meet that requirement the Lone Star Gasoline Co. has selected two devices which they consider the most efficient and economical. These devices have been approved by the Interstate Commerce Commission.

It is necessary to use a gasket with this type of cover, such as is used on other types. To provide an efficient gasket, involving the least expense, an asbestos rope applied with shellac is used. The joint face of the screw type manhole cover is thickly coated with shellac, and the rope is then wound around on the face of the joint and thoroughly pressed into the shellac. After this has dried, a coating of graphite and oil is applied to the exposed side of the rope, so that it will slip on the joint face of the dome ring without tearing. The gasket for the bolt type is made by shellacing the groove in the dome ring and placing asbestos rope therein. When the shellac has set, a coating of graphite and oil is applied to the top side. A gasket made in this manner will last indefinitely, and will not become lost by being removed and failing to be replaced. It is well to coat the threads on the manhole cover and the outlet chamber with graphite and oil, as this will prevent rust and wear. It will also allow the tightening and loosening of them with less effort.

FIFTEEN-CENT CRUDE INCREASE ON APRIL 1

(Continued from Page 22)

West Virginia. The same is true for refineries using Pennsylvania grade crude in the Pittsburgh area, with the exception that Bradford-Allegany crude and crude run in the National Transit lines is not shipped that far south, but in their places oil produced in Southwest Pennsylvania is substituted.

At various times there has existed a difference in the delivered price of the different Pennsylvania grade crudes, which differential represents, apart from pipe line charges, either the difference in refining costs of the different crudes, or a surplus of stocks in one or more producing fields, or, at times, both factors together. With the 25 per cent curtailment in production still existing in Southwest Pennsylvania, Southeast Ohio and West Virginia, and the present restriction in the Bradford and Allegany Fields continuing, the advance of Buckeye, and the decrease of Bradford were merely adjustments of the local price structures.

NEW OIL STORAGE IN CHINA

NEW YORK, Mar. 28.—Asiatic Petroleum Corp. has completed the erection of four 108-foot by 33-foot oil storage tanks, equipped with Wiggins roofs, at Pootoo, China, 13 miles from Shanghai on the Whangpoo River, scene of the recent hostilities between Japan and China. The new storage plant is located on an island, and is accessible only by boats. W. A. F. Millinger, mechanical engineer of the Shell Oil Co., was in charge of the construction of the plant, which was erected by the Yuen Chong Tai Iron Works. All of the joints of the Wiggins roofs were electrically welded by native welders.

EAST TEXAS FIELDS

(Continued from Page 31)

Gibbs Survey in southwestern Cherokee County, south and west of Rusk County. The Mustang Oil Co. has a location for a test in this survey northwest of a 5,270-foot dry hole. The location is on a core drill structure, on which 46 core drill tests have been drilled.

Effective Monday at 7 a.m., the Magnolia Petroleum Co. is purchasing from its connections in the East Texas Field 72 bbls. per well per day seven days in the week and will produce from its own lease on the same basis. For several weeks this company has been producing and purchasing only 65 bbls. per well per day.

COMPLETIONS IN EAST TEXAS

Gregg County

Abernathy and Kirkpatrick's No. 1 R. M. Wood, top sand 3,638 feet, initial production 75 bbls. in 40 minutes through 1-inch tubing choke, total depth 3,662 feet. Amerada Petroleum Corp.'s No. 5 L. R. Hearne, top sand 3,500 feet, initial production 110 bbls. per hour through 1-inch tubing choke, total depth 3,510 feet. Atlantic Oil Producing Co.'s No. 3 Duncan, top sand 3,599 feet, initial production 53 bbls. per hour through tapered tubing, total depth 3,650 feet; No. 6 Duncan, top sand 3,616 feet, initial production 33 bbls. per hour through tapered tubing, total depth 3,662 feet; No. 3 Wilson, top sand 3,585 feet, initial production 64 bbls. per hour through tapered tubing, total depth 3,620 feet; No. 4 Wilson, top sand 3,556 feet, initial production 36 bbls. per hour through tapered tubing, total depth 3,599 feet.

Barnsdall Oil Co.'s No. 8 G. E. Adams, top sand 3,583 feet, initial production 143 bbls. per hour through 1-inch tubing choke, total depth 3,675 feet. Barnsdall and Houston's No. 10 McGrede, top sand 3,626 feet, initial production 134 bbls. per hour through 1-inch tubing choke, total depth 3,670 feet. J. Beard and others' No. 2 W. L. Fuller, top sand 3,686 feet, initial production 71 bbls. per hour through 1-inch tubing choke, total depth 3,721 feet. Bishop Oil Corp.'s No. 2 Todd, top sand 3,529 feet, initial production 16 bbls. in one-quarter hour through 1-inch tubing choke, total depth 3,591 feet. Columbia Oil & Gas Co.'s No. 1 Castleberry, top sand 3,640 feet, dry and abandoned, total depth 3,684 feet.

East Texas Refining Co.'s No. 2 Christian, top sand 3,619 feet, initial production 50 bbls. in one-half hour through three-quarters-inch tubing choke, total depth 3,636 feet; No. 2 Christian, top sand 3,619 feet, initial production 50 bbls. in one-half hour through three-quarters-inch tubing choke, total depth 3,636 feet. Faith Oil Co.'s No. 1 Walters, top sand 3,670 feet, initial production 25 bbls. in 10 minutes through open tubing, total depth 3,697 feet. S. A. Guiberson's No. 2 Thrasher and Stuckey, top sand 3,544 feet, initial production 93 bbls. per hour through 1-inch tubing choke, total depth 3,594 feet. Humble Oil & Refining Co.'s No. 7 W. R. Hughes, top sand 3,633 feet, initial production 23 bbls. in one-quarter hour through three-quarters-inch tubing choke, total depth 3,642 feet. Moss and others' No. 2 Tennery, top sand 3,574 feet, initial production 55 bbls. in 24 hours through open tubing, total depth 3,600 feet.

Prairie Oil & Gas Co.'s No. 3 Adkins, top sand 3,630 feet, initial production 34 bbls. per hour through one-half inch tubing choke, total depth 3,570 feet. A. D. Robinson and others' No. 1 L. Rodden, top sand 3,602 feet, initial production 25 bbls. in 15 minutes through 1-inch tubing choke, total depth 3,616 feet. Shasta Oil Co.'s No. 3-A Campbell, top sand 3,585 feet, initial production 75 bbls. per hour through three-fourths inch tubing choke, total depth 3,642 feet. Shell Petroleum Corp.'s No. 1 B. Moore, top sand 3,546 feet, initial production 34 bbls. per hour through tapered tubing, total depth 3,608 feet. Shipper and others' No. 2 Maggie Magrill, top sand 3,632 feet, initial production 471 bbls. per hour through casing, total depth 3,651 feet. Stanolind Oil & Gas Co. and Simms Oil Co.'s No. 1 Akin, top sand 3,511 feet, initial production 45 bbls. in 15 minutes through open tubing, total depth 3,604 feet; No. 12 Persons, top sand 3,509 feet, initial production 70 bbls. in 15 minutes through open tubing, total depth 3,668 feet.

Tidal Oil Co.'s No. 6 J. J. Castleberry, top sand 3,594 feet, initial production 10 bbs. in 10 minutes through open tubing, total depth 3,610 feet; No. 3 Arch Davis, top sand 3,552 feet, initial production 43 bbls. in 10 minutes, total depth 3,582 feet; No. 5 W. E. Jones, top sand 3,618 feet, initial production 27 bbls. in 10 minutes through open tubing, total depth 3,633 feet. M. E. Trapp and others' No. 1 A. N. Neeley, top sand 3,509 feet, initial production 45 bbls. in 30 minutes through 1-inch tubing choke, total depth 3,541 feet. Waggoner and McCownell's No. 1 A. J. Green, top sand 3,600 feet, initial production 26 bbls. in 15 minutes through 1-inch tubing choke, total depth 3,612 feet.

Yount-Lee Oil Co.'s No. 2 M. M. Custer, top sand 3,532 feet, initial production 74 bbls. per hour through eleven-sixteenths inch tubing choke, total depth 3,648 feet; No. 3-C F. K. Lathrop, top sand 3,623 feet, initial production 86 bbls. per hour through eleven-sixteenths inch tubing choke, total depth 3,642 feet; Doss and Jones' No. 4 Hagler, top sand 3,593 feet, initial production 72 bbls. in 30 minutes through three-fourths inch tubing choke, total depth 3,615 feet.

Gulf Production Co.'s No. 7 Birdsong, top sand 3,561 feet, initial production 77 bbls. per hour through three-fourths inch tubing choke, total depth 3,586 feet; No. 3 C. Brown, top sand 3,509 feet, initial production 140 bbls. per hour through three-fourths inch tubing choke, total depth 3,524 feet; No. 14 Hilburn, top sand 3,624 feet, initial production 78 bbls. per hour through three-fourths inch tubing choke, total depth 3,633 feet; No. 6 W. Holt, top sand 3,558 feet, initial production 100 bbls. per hour through three-fourths inch tubing choke, total depth 3,570 feet. D. M. Hester's No. 1 Crews, top sand 3,678 feet, initial production 75 bbls. per day through open tubing, total depth 3,685 feet. Jones and O'Brien, Inc.'s No. 2 Hughey-Jones, top sand 3,491 feet, initial production 40 bbls. in 30 minutes through three-fourths inch tubing choke, total depth 3,521 feet. B. F. Findley's No. 1 C. C. Crews, top sand 3,681 feet, dry and abandoned, total depth 3,685 feet.

Magnolia Petroleum Co.'s No. 4 Sam Carr, top sand 3,430 feet, initial production 176 bbls. per hour through 1-inch tubing choke, total depth 3,459 feet; No. 5 J. King, top sand 3,666 feet, initial production 32 bbls. in five minutes through three-quarters-inch tubing choke, and 5-inch line, total depth 3,668 feet. Bay Oil Corp.'s No. 1 W. P. Crews, top sand 3,716 feet, initial production 60 bbls. per hour through three-quarters-inch tubing choke, total depth 3,719 feet. Quad Oil Corp.'s No. 1-A Duncan, top sand 3,674 feet, initial production 72 bbls. per day through pinched tubing, total depth 3,678 feet. Searight and others' No. 2 J. M. Blackman, top sand 3,651 feet, initial production 72 bbls. per day pinched through tubing, total depth 3,654 feet.

Shell Petroleum Corp.'s No. 4-A M. H. Bivens, top sand 3,598 feet, initial production 13 bbls. in one-half hour through tapered tubing, total depth 3,618 feet; No. 2 Jobe, top sand 3,518 feet, initial production 32 bbls. per hour through tapered tubing, total depth 3,587 feet. Stroube and Stroube's No. 1 M. B. Hughey, top sand 3,595 feet, initial production 45 bbls. per hour through tapered tubing, total depth 3,524 feet. Wheelock and Collins' No. 3 Clayton heirs, top sand 3,533 feet, initial production 190 bbls. per hour through 2½-inch tubing choke, total depth 3,558 feet.

Hopkins County

E. L. Chapman's No. 1 J. D. Jumper, temporarily abandoned, 230 feet.

Red River County

Gibbs and others' No. 1 Mace, temporarily abandoned, total depth 3,529 feet. L. G. Priest and others' No. 1 J. M. Stiles, dry and abandoned, total depth 1,981 feet. J. Fred Johnson's No. 1 J. E. Styles, temporarily abandoned, total depth 3,564 feet.

Rusk County

Gulf Production Co.'s No. 4 C. E. Christian, top sand 3,692 feet, initial production 45 bbls. per hour through three-quarters-inch tubing choke, total depth 3,699 feet. Humble Oil & Refining Co.'s No. 1 W. D. Peterson, top sand 3,547 feet, initial production 55 bbls. per hour through three-quarters-inch tubing choke, total depth 3,643 feet. Lewis Production and Selby Oil & Gas Co.'s No. 5 L. C. Pegues, top sand 3,603 feet, initial production 40 bbls. in 20 minutes through three-quarters-inch tubing choke, total depth 3,653 feet. Rajo Oil Corp.'s No. 1 I.&G.N., top sand 3,611 feet, initial production 25 bbls. in one-quarter hour through three-quarters-inch tubing choke, total depth 3,650 feet. Tidal Oil Co.'s No. 6 Moore, top sand 3,656 feet, initial production 72 bbls. per day pinched through tubing, total depth 3,660 feet.

British American's No. 5 J. D. Stone, top sand 3,625 feet, initial production 170 bbls. per hour through open tubing, total depth 3,660 feet. Jim Cloud's No. 2 W. F. Neal, top sand 3,803 feet, initial production 21 bbls. in 10 minutes through open tubing, total depth 3,806 feet. Gulf Production Co.'s No. 1-D Mayfield Company, top sand 3,627 feet, initial production 78 bbls. per hour through three-quarters-inch tubing choke, total depth 3,637 feet. Hugh Edwards Hale's No. 1 Marshall Clay, top sand 3,504 feet, initial production 44 bbls. per hour through open tubing, total depth 3,686 feet.

Humble Oil & Refining Co.'s No. 4-C Ida Holt, top sand 3,676 feet, initial production 58 bbls. per hour through three-quarters-inch tubing choke, total depth 3,789 feet; No. 17 Kangerga, top sand 3,679 feet, initial production 73 bbls. per hour through three-quarters-inch tubing choke, total depth 3,717 feet; No. 3-B J. E. Sexton, top sand 3,656 feet, initial production 40 bbls. in one-half hour through three-quarters-inch tubing choke, total depth 3,636 feet; No. 4-A R. E. L. Silvey, top sand 3,739 feet, initial production 55 bbls. in one-half hour through three-quarters-inch tubing choke, total depth 3,781 feet; No. 3-B R. E. L. Silvey, top sand 3,608 feet, initial production 49 bbls. in one-half hour through three-quarters-inch tubing choke, total depth 3,719 feet.

Kirby Petroleum Co.'s No. 3 Joe Williams, top sand 3,632 feet, initial production 75 bbls. in one-half hour through open tubing, total depth 3,754 feet. Mid-Kansas Oil & Gas Co.'s No. 1 H. C. and G. W. Burton, top sand 3,642 feet, initial production 150 bbls. per hour through open tubing, total depth 3,671 feet; No. 2 J. M. Price, top sand 3,625 feet, initial production 170 bbls. per hour through open tubing, total depth 3,668 feet. Sinclair Oil & Gas Co.'s No. 18 Kinney, top sand 3,642 feet, initial pro-

COMMISSIONERS ANTICIPATE GREATER CRUDE OIL DEMAND

By Special Correspondent

AUSTIN, Tex., Mar. 28.—Recommendations were made at a three-state oil conference here March 25 for revision of the state allowables of Kansas, Oklahoma, California and Texas.

The conference was held by representatives of the other states with Railroad Commissioners C. V. Terrell and Lon A. Smith of Texas, but it was stated that Texas was not asked formally to join in agreements fixing the allowables, and that Texas would not re-enter such a regional agreement as was made last year.

The schedule, as worked out by Thurman Hill, public service commissioner of Kansas; W. H. Cooley, chairman of the oil states advisory committee, Bakersfield, Calif.; and Paul A. Walker, Oklahoma City, chairman of the Oklahoma Corporation Commission, recommended that Texas output be reduced to 875,000 bbls. daily, from 902,000-bbl. limit fixed a year ago; that California's output be reduced to 475,000 bbls. from the present 500,000-bbl. limit; that Oklahoma's output be increased to 575,000 bbls. daily from the present 546,000, and Kansas' output be increased from 110,000 to 130,000 bbls. daily.

Former recommendations for other states were left unchanged as follows: Arkansas, 45,000 bbls.; Louisiana, 65,000 bbls.; Rocky Mountain region, 50,000 bbls.; New Mexico, 50,000 bbls.; eastern states, 108,000 bbls.

Mr. Hill said it was not desired that Texas enter an agreement, but that its co-operation in oil conservation was sought.

The conference was held on the eve of new hearings March 30 by the Texas commission to consider proration allowables on all fields except East Texas and the Van Field, to be placed in effect April 1, when present schedules expire. East Texas is limited to 325,000 bbls. per day.

The Texas commissioners listened to the reasons advanced by Messrs. Hill, Cooley and Walker in making changes in allowable production, and in making future proration adjustments can be guided or not, as they see fit, by the recommendations made here Friday, but they must treat each Texas pool separately.

Governor Sterling was not in Austin on the day of the meeting and neither was Cullen F. Thomas of Dallas, the governor's representative at the sessions of the Oil States Advisory Committee.

The recommendations of Messrs. Hill, Walker and Cooley compared with the average daily production in the week ending March 19 were as follows:

State—	Average daily prod. March 19	Recommended allowable production
California	507,000	475,000
Oklahoma	420,530	575,000
Kansas	99,245	130,000
Texas	845,836	875,000
Louisiana	53,385	65,000
Arkansas	34,135	45,000
Rocky Mountain	45,522	50,000
S. E. New Mexico	36,065	50,000
Eastern Fields	114,000	108,000
Total U. S.	2,155,718	2,373,000

Cooley's Statement

Mr. Cooley at the close of today's meeting gave out the following statement:

"The conference of the Oil States Advisory Committee on production allowables with the representatives of the Texas, Oklahoma and Kansas commissioners was harmonious.

"The regulatory bodies were strongly in favor of co-operating further in conserving oil and declared they did not propose to open wide any fields or permit a reccurrence of the intolerable conditions obtaining in 1931.

"I am firmly convinced that the prompt action taken by the authorities of the oil states with the help of the Nine States Oil Advisory Committee in September, 1931, saved the industry from demoralization. The allowable committee decided to recommend a total output of 2,373,000 bbls. of crude daily for the next six months.

"Had the purchasers failed to increase the price as the governor's committee suggested at Oklahoma City three weeks ago the allowables would have been drastically reduced, but the price increase of Thursday made such action unnecessary.

"As the requirements for crude oil during the next six months will be in excess of the figures set by the committee, it will result in storage stocks being materially reduced.

"The oil industry is on the upturn and I look for even better prices before this year is over. It remains desirable, however, to lend the assistance of the governor's committee to the question of refining and marketing in an attempt to bring better harmony into this division of the industry."

duction 52 bbls. in one-quarter hour through tubing, total depth 3,653 feet. G. C. Wood's No. 1 Mrs. J. B. Irwin, top sand 3,817 feet, initial production estimated 20 bbls. per hour through open tubing, total depth 3,820 feet.

Smith County

Iowa Payne Oil Co.'s No. 1 J. B. Wilson, top sand 3,740 feet, initial production 40 bbls. in one-quarter hour through open tubing, total depth 3,745 feet. Sinclair Oil & Gas Co.'s No. 7 R. G. Wright, top sand 3,728 feet, initial production 45 bbls. in one-quarter hour through open tubing, total depth 3,738 feet. Sun Oil Co.'s No. 1-B H. A. Pace, top sand 3,699 feet, initial production 96 bbls. per hour through tubing, total depth 3,704 feet.

Titus County

Joiner and others' No. 1 Clayton Brown, temporarily abandoned, total depth 2,250 feet.

Upshur County

E. & D. Oil Co.'s No. 1 Thomas Well, top sand 3,704 feet, initial production 100 bbls. per hour through 1-inch tubing choke, total depth 3,716 feet. Eslick and others' No. 1 H. F. Whitehurst, top sand 3,612 feet, initial production 25 bbls. in 10 minutes through 1-inch tubing choke, total depth 3,628 feet. Humble Oil & Refining Co.'s No. 3 Ethel Edwards, top sand 3,583 feet, initial production 80 bbls. per hour through three-quarters-inch tubing choke, total depth 3,619 feet; No. 2-B Miller, top sand 3,648 feet, initial production 76 bbls. per hour through three-quarters-inch tubing choke, total depth 3,684 feet.

Van Zandt County

Pure Oil Co.'s No. 3 J. H. Leonard, initial production 110 bbls. estimated, through eleven-sixteenths-inch tubing choke, total depth 2,947 feet; No. 3 J. M. Martin, initial production 190 bbls. estimated, through eleven-sixteenths-inch tubing choke, total depth 2,968 feet.

THREE CAREERS INVITED EDWARD A. OLSEN

(Continued from Page 23)

took Mr. Olsen to many parts of the United States, and the experience gained contributed greatly to the foundation he was building as an expert in utility management.

Early in 1926 Mr. Olsen went to Florida as executive vice president of the Florida Power Corp., West Florida Power Co., Georgia Power & Light Co. and the Florida West Coast Ice Co. These affiliated organizations, with headquarters in St. Petersburg, Fla., served northern and western Florida and part of Georgia. Mr. Olsen directed them till 1928, when he took over the management of the newly created Pacific Public Service Corp. as operating vice president. This organization, with general offices in San Francisco, Calif., provided gas and electric service in five California counties in the San Francisco Bay area and ice, water and cold storage in Los Angeles. Through subsidiaries it developed natural gas properties along the West Coast from the Mexican border northward through California, Oregon and Washington. Many of the problems involved in planning and constructing the 190 miles of 26, 24 and 22-inch natural gas line from Kettleman Hills to the industrial area adjacent to San Francisco Bay were handled by Mr. Olsen.

With the broad background he now had acquired in the management of public utility properties, Mr. Olsen in February, 1931, became executive vice president of the Oklahoma Natural Gas Corp., largest utility in Oklahoma. In November of that year he was made president. Residing in Tulsa, he has offices in both that city and Oklahoma City.

Deep Interest in Safety Work

An interest in safety and first-aid work that is too deep and serious to be referred to as a hobby should be mentioned. Talking to a safety team organized among women employes of the Oklahoma Natural Gas Corp., Mr. Olsen said: "Nobody can understand fully the tremendous value of first-aid training until he has been placed where a human life may depend on it. I was called from my office in Alexandria, Va., one day 12 years ago. A workman was believed to have been killed by a high-voltage electric current. I hurried to where a circle of horrified but helpless men surrounded an unconscious body. There was a pulmotor, but none of the crowd knew how to use it. One other man in the organization and I applied the prone pressure method of resuscitation for an hour and a half in a fruitless effort to bring life back to the victim of the accident. We were exhausted, but there was none to help us. If this method had been employed immediately the injured man might have been saved, and if there had been an organized first-aid team it would not have been necessary to wait until I arrived. From that time to this I have insisted upon training in safety and first-aid measures."

Mr. Olsen is a baseball enthusiast and he can tell you the batting averages of leading hitters in the major leagues throughout the playing season. He likes to fish, but even when they are biting he limits his catch to the number he or his friends can eat. In earlier years he enjoyed hunting. In explanation of his diminishing enthusiasm for this form of sport he remarked recently: "I like wild life. I enjoy watching it. But I find less and less pleasure in shooting some beautiful creature of the woods just for the experience of picking up its bloody carcass and showing it as a trophy. In fact, I'm getting so I don't find any pleasure in it at all."

He loves the water with an ardor that amounts almost to a passion. A line of seafaring ancestors in Norway may have something to do with that. When he lived in St. Petersburg, Fla., he acquired a seagoing launch and he indulged his fondness for the ocean as often as busy days would permit.

Mr. Olsen is a member of the American Institute of Electrical Engineers, American Gas Association, National Electric Light Association and the American Society of Military Engineers.

DECISION OF FEDERAL BENCH CHALLENGED BY TEXAS COURT

AUSTIN, Tex., Mar. 28.—In conflict with a three-judge Federal Court which sat in Houston, the Third Court of Civil Appeals in Austin has decided that the Railroad Commission was within its legal rights when taking market demand into consideration in making proration orders to prevent underground or other actual physical waste of oil produced in Texas. It so held in affirming the case of the Danciger Oil & Refining Co. versus Railroad Commission from Travis County, wherein an injunction was vainly sought to prevent the enforcement of the commission's proration orders in the Panhandle Field, which limited the daily output to 40,000 bbls. Associate Justice J. H. Baugh delivered the opinion. The company's 42 wells of 5,200 bbls. capacity were held to 25 per cent of that potentiality under the commission's orders.

The orders attacked were made under an old law which permitted market demand to be taken into consideration. When the three-judge Federal Court held that act void because it did contemplate market demand consideration Governor Sterling called a special session of the legislature, which amended the conservation laws and not only repealed the market demand permission, but specifically prohibited its use as a basis for proration orders. The case was styled McMillan versus Railroad Commission and is now on appeal to the U. S. Supreme Court. It was cited as decisive of the instant case, but the appellate court point blank refused to follow it and the issue now goes to the Supreme Court.

McMillan Case Cited

Speaking of the reliance on the McMillan case, Justice Baugh wrote that "it held that plaintiff in that case had shown that proration, or ratable withdrawals, would have some effect to prevent waste," but that "in the light of present knowledge this was largely theory and speculation." That opinion does not disclose what "light of present knowledge" was before the court. But in the instant case there was ample evidence to show that, in the Panhandle district, where the potential production was far beyond the available outlet, where some wells were operated to capacity, while others were shut down because they could not store nor dispose of their oil, and where above ground storage was already excessive, in brief, where conditions prevailed causing physical waste, proration of output or ratable taking from the field within prescribed limits was a reasonable and effective method of minimizing that waste. Not only was there ample proof by competent evidence to show a reasonable relation between proration of production from the field as a whole and a reduction thereof below its potential and the prevention of waste, but such method of preventing waste arising from overproduction has been recognized and authorized as a reasonable and effective method of doing so by the legislatures of Kansas, California and Oklahoma.

Differs With Federal Court

"While we have great deference and regard for opinion of the court that decided the McMillan case, but in the light of the evidence in this record, and of the fact that the legislatures of four leading oil-producing states of the nation have recognized and authorized proration as a reasonable and effective means of preventing underground waste, we are constrained to differ with the conclusion of that honorable court that results of such method are largely 'theory and speculation,' and since the court in that case did not base its decision on any federal question, but on the ground that the powers claimed by the commission under the state law had not been relegated to it by that law, we must differ with that estimable court and respectfully decline to follow its construction of our statute. The rule of construction in such cases is that the federal courts follow the interpretation and construction placed by the courts of last resort of the state upon its own statutes where no federal question is involved; and not that the state court must follow the construction thereof by an inferior Federal Court."

From the foregoing it will be seen that the State Appellate Court not only overrules the Federal Court but reminds that in state law construction the state courts are supreme and their rulings must be followed, instead of permitting federal courts to dominate.

In his opinion Justice Baugh stresses the fact that if economic conditions cause waste by overproduction proration orders to stop that waste must be observed and will be upheld by the courts. It now remains to be seen whether the United States Supreme Court will defer to the Appellate Court's views or follow the three federal judges in the McMillan case provided the Texas Supreme Court affirms the Danciger case.

FRED THOMAS PASSES ON AT HIS MT. VERNON HOME

Fred Thomas, vice president and executive manager of the Cooper-Bessemer Corp., died Sunday night at his home at Mount Vernon, Ohio. Complications resulting from influenza suffered early last December was the cause of his death.

Mr. Thomas was formerly vice president of the C. & G. Cooper Co. and in 1929, when the firm was merged with the Bessemer Gas Engine Co., he was made vice president and executive manager.

NATIONAL OIL SCOUTS' PROGRAM COMPLETED

HOUSTON, Tex., Mar. 28.—Field trips to Sugarland and Boling, a visit through the Houston plant of the Sinclair Refining Co., and a boat ride down the Houston Ship Channel are among the features which have been arranged for the eighth annual convention of the National Oil Scouts Association to be held here May 15, 16 and 17.

Detailed arrangements have been placed in the hands of special committees of the Houston Oil Scouts Association. L. S. McGee, Humble Oil & Refining Co., and a vice president of the national organization, is chairman of the general arrangements committee, included on which are Harry M. Sample, Magnolia Petroleum Co.; G. C. Francisco, Jr., Sun Oil Co.; Raymond Willis, Magnolia Petroleum Co., and George E. Robinson, Pure Oil Co.

Special committees appointed are: Finance, Harry M. Sample; registration, George E. Robinson; entertainment, Elton Rhine, Empire Gas & Fuel Co.; refinery trip, Jack Cave, Sinclair Oil & Gas Co.; hotel arrangements, L. V. Manry; transportation, Hill Adams, Republic Production Co., and unofficially, refreshments, Bob Moore, Magnolia Petroleum Co.

According to plans already made, registration of the scouts, who will come from all parts of Texas, Arkansas, Louisiana, Mississippi and New Mexico, will begin at 9 o'clock Sunday morning, May 15, and the first general meeting will be held Sunday afternoon. The Sugarland trip will be in charge of W. W. Scott, chief engineer of the Humble Oil & Refining Co.

From Sugarland the party will go to Boling to visit the sulphur mines of the Texas Gulf Sulphur Co. Plans are being made for a barbecue luncheon there, following which the party will return to Houston to visit the Sinclair refinery. At the Sinclair docks, a boat will be waiting to take the party to San Jacinto Inn, where dinner will be served.

The business session is scheduled for Tuesday morning. In the afternoon there will be a golf tournament or other entertainment for the men and bridge parties for the women, and in the evening a dinner dance.

TANK WAGON CHANGES

(Continued from Page 148)

cent throughout territory (Louisiana, Tennessee and Arkansas). Company, effective March 19, advanced gasoline tank wagon and service station prices 1 cent at Lake Charles, La. Company, effective March 18, reduced kerosene tank wagon price 2 cents at Alexandria, La.

Standard Oil Co. of Kentucky, effective March 21, advanced gasoline tank wagon and service station prices 1 cent at Covington, Ky. Company, effective March 19, advanced gasoline tank wagon price 1 cent at Jacksonville, Fla., and on March 21 reduced kerosene tank wagon price 1 cent. Company, effective March 19, advanced gasoline tank wagon price 1 cent at Tampa, Fla., and on March 17 reduced kerosene tank wagon price to 12 cents. Company, effective March 19, reduced gasoline service station price 1 cent at Miami, Fla. Company, effective March 19, advanced gasoline tank wagon and service station prices 1 cent at Pensacola, Fla.

Standard Oil Co. of New Jersey, effective March 21, advanced gasoline tank wagon and service station prices one-half cent throughout territory.

Standard Oil Co. of Indiana effective March 16 reduced gasoline service station price 1.1 cents at Quincy, Ill. Company effective March 22 made minor changes in gasoline or kerosene prices at Grand Rapids, Saginaw, Evansville, Indianapolis and South Bend due to changes in freight rates.

Standard Oil Co. of Ohio effective March 29 advanced gasoline tank wagon and service station prices one-half cent at Ohio points.

JUSTICE BRANDEIS CONSIDERS PRORATION AND STABILIZATION

WASHINGTON, D. C., Mar. 28.—Louis D. Brandeis, associate justice of the Supreme Court, asserted in the course of a dissenting opinion that many persons believe "unbridled competition" to be one of the chief causes of the economic depression. He said also that all persons agreed that irregularity in employment could not be coped with unless production and consumption are more nearly balanced.

Some thoughtful men, he stated, believed that plans for proration and stabilization will be futile unless, in some way, a certificate of public convenience and necessity was made a prerequisite to investment of new capital in an industry where capacity already exceeds the production schedules.

The dissenting opinion was given in the appeal of the New State Ice Co. of Oklahoma City against Ernest A. Liebman. Under Oklahoma laws, the ice company had obtained a certificate of public convenience and necessity from the State Corporation Commission, had invested $500,000 in a plant and had been making ice for some years.

Liebman, without obtaining or applying for a license, started to build a plant of his own. The ice company brought suit.

Liebman contended that ice manufacture is not a public but a private business, that he had a constitutional right to engage in a common calling, and that to make that right dependent upon a finding of public necessity deprived him of his constitutional prerogatives.

The Western Oklahoma District Court and the Tenth Circuit Court of Appeals sustained Liebman's plea, and the ice company appealed to the Supreme Court. In an opinion by Justice Sutherland the court held in Liebman's favor, but Justice Brandeis uttered the dissenting opinion in which Justice Stone concurred.

Unbridled Competition

"The people of the United States are now confronted with an emergency more serious than war," Justice Brandeis said. "Misery is widespread in a time not of scarcity but of overabundance. The long-continued depression has brought unprecedented unemployment, a catastrophic fall in commodity prices and a volume of economic losses which threatens our financial institutions. Some people believe that the existing conditions threaten even the stability of the capitalistic system.

"Economists are searching for the causes of this disorder and are re-examining the bases of our industrial structure. Business men are seeking possible remedies. Most of them realize that failure to distribute widely the profits of industry has been a prime cause of our present plight. But rightly or wrongly, many persons think that one of the major contributing causes has been unbridled competition.

"Increasingly, doubt is expressed whether it is economically wise, or morally right, that men should be permitted to add to the producing facilities of an industry which is already suffering from overcapacity. In justification of that doubt, men point to the excess capacity of our productive facilities resulting from their vast expansion without corresponding increase in the consumptive capacity of the people. They assert that through improved methods of manufacture, made possible by advances in science and invention and vast accumulation of capital, our industries had become capable of producing from 30 to 100 per cent more than was consumed even in days of vaunted prosperity; and that the present capacity will, for a long time, exceed the needs of business.

Plans for Proration

"All agree that irregularity in employment—the greatest of our evils—cannot be overcome unless production and consumption are more nearly balanced. Many insist there must be some form of economic control. There are plans for proration. There are proposals for stabilization.

"Some thoughtful men of wide business experience insist that all projects for stabilization and proration must prove futile unless, in some way, the equivalent of the certificate of public convenience and necessity is made a prerequisite to embarking new capital in an industry in which the capacity already exceeds the production schedules.

"Whether that view is sound, nobody knows. The objections to the proposal are obvious and grave. The remedy might bring evils worse than the present disease. The obstacles to success seem insuperable. Economic and social sciences are largely uncharted seas.

"We have been none too successful in the modest essays in economic control already entered upon. The new proposal involves a vast extension of the area of control. Merely to acquire the knowledge required as a basis for the exercise of this multitude of judgments would be a formidable task.

"Each of the thousands of judgments involved in carrying out the plan would call for some measure of prophecy. But even more serious are the obstacles to success which inhere in the demands which execution of the project would make upon human intelligence and upon the character of men. Man is weak and his judgment is at best fallible.

Value of Experimentation

"Yet the advances in the exact sciences and the achievements in invention remind us that the seemingly impossible sometimes happens. There are many men now living who were in the habit of using the age-old expression: 'It is as impossible as flying.' The discoveries in the physical science, the triumphs in invention, attest the value of the process of trial and error. These advances have been due, in large measure, to experimentation—which for two centuries has been not only free but encouraged.

"Some say that our present plight is due, in large measure, to the discouragement to which social and economic invention has been subjected. I cannot believe that the framers of the fourteenth amendment, or the states which ratified it, intended to leave us helpless to correct the evils of technological unemployment and excess productive capacity which the march of invention and discovery have entailed. There must be power in the states and the nation to remould through experimentation our economic practices and institutions to meet changing social and economic needs.

"To stay experimentation within the law in things social and economic is a grave responsibility. Denial of the right to such experimentation may be fraught with serious consequences to the nation. It is one of the happy incidents of the federal system that a single courageous state may, if its citizens choose, serve as a laboratory, and try novel social and economic experiments without risk to the rest of the country. This court has the power to stay such experimentation. We may strike down the statute embodying it on the ground that, in our opinion, it is arbitrary, capricious or unreasonable; for the due process clause has been held applicable to matters of substantive law as well as to matters of procedure. But in the exercise of this power we should ever be on guard, lest we erect our prejudices into legal principles. If we would guide by the light of reason, we must let our minds be bold."

Justice Sutherland, delivering the majority opinion, declared that "it is not necessary to challenge the authority of the state to indulge in experimental legislation, but it would be a strange and unwarranted doctrine to transcend the limitation imposed upon them by the federal Constitution."

ISO-OCTANE

Each batch is certified by the U. S. Bureau of Standards before being released for shipment.

Manufactured by

Röhm & Haas Co., Inc.

222 W. Washington Square Philadelphia, Pa.

BROAD ADVANCE IN OKLAHOMA QUOTATIONS

(Continued from Page 18)

ment of operations. The same situation applies to the production of crude oil and wholesale and retail marketing and due to that fact, some students of conditions in the petroleum industry believe that the continuance of the whole scheme of proration and curtailed operations which has been made effective in recent months is now at stake in the effort being made to place the industry's operations on a profitable basis.

Gasoline and Naphtha

The market on U. S. Motor gasoline under 57 octane moved up to a low of 3⅞ cents on Tuesday in Oklahoma with a majority of the larger refiners in the State quoting 4¼ cents. The 3⅞-cent low represents a half cent advance over the market of a week ago when the spot market was weak. The announcement last week of the higher crude oil schedules served to stimulate spot buying and also more material was ordered out on contracts. In regard to contracts it is felt that if the new price schedules are adopted generally April 1 the tank wagon and service station schedules will be advanced at least 1 cent throughout the Middle West and Southwest. Anticipating this development some jobbers are ordering out greater quantities of gasoline from their refinery sources of supply and filling storage when necessary. In regard to storage, one refinery operator in Oklahoma expresses the opinion that there will be less storage of gasoline by jobbers this spring than in previous years. This is due, he states, to the fact that many jobbers cannot obtain the usual assistance from their local banks or refiners to finance these storage programs. It is known that many refiners have adopted a less liberal policy in regard to all types of credit than in the past. Jobbers buying currently for all of their heavier requirements during the summer months is another favorable development for the spot refinery market. Stricter policies in regard to extension of credit also is construed as favorable.

As has been the case throughout the month, spot trading in gasolines continues light. Resale low octane U. S. Motor gasoline was scarce at 3¾ cents on Tuesday and it was thought that a low of 4 cents would be established by the end of the week. One large Oklahoma refiner has been a buyer of the under 57 octane and 57-65 octane grades and it is understood there will be additional inter-refinery buying before the end of the month.

The middle octane grade on Tuesday was quoted at a low of 4¼ cents with a high of 4½ cents. The above 65 octane was one-fourth cent higher.

The 60-62 400 grades of gasoline were available at one-eighth cent above the U. S. Motor grades. The dearth of buying in the 390 to 350 endpoint grades varying in gravity from 60 to 70 continues. More and more buyers of high gravity and low endpoint refinery gasolines are shifting to the stabilized natural gasolines. Prices on the refinery grades were advanced by the few sellers one-eighth cent.

Refinery naphthas for blending varying in gravity from 48 to 52 and from 450 to 437 in endpoint are selling at a low of 3⅝ cents to 4 cents. The demand is absorbing the small quantity of material offered.

Natural Gasoline

Sales of the 26-70 natural gasoline on Tuesday were at 2 cents. No large orders were reported during the week but there has been steady buying in 1 to 15 car lots that have prevented distress material being offered on the market either in Oklahoma or Texas. Scattered sales of higher vapor pressure material usually meeting the 30-70 grade specifications were made on Tuesday at 1⅞ cents.

The 18-55 grade was selling at a low of 2⅝ cents with a price range up to 2¾ cents. The wide spread in this grade reflects a variation in actual specifications not only in vapor pressure and recovery but also in guaranteed octane rating.

The grades under 12 pounds vapor pressure with recoveries up to 98 per cent are now bringing a low of 3½ cents with sales of 10-pound material reported at 5 cents.

Kerosene and Tractor Fuel

Prices on most grades of kerosene and tractor fuel which are closely related in methods of manufacture and marketing are one-eighth cent higher than last week. The spring agricultural demand for these products is better than expected and supplies, particularly in Oklahoma and Kansas are limited. Refiners who have curtailed their refinery operations continue to be among the buyers of these products.

The low on the 41-43 water white kerosene advanced to a low of 2¾ cents with sales reported at 2⅞ and 3 cents. The low on a tractor fuel with a flash under 175 and an endpoint under 575 was 2⅛ cents with prime white grades selling as high as 2⅝ cents.

Furnace Oils

There has been enough refinery and jobber buying of furnace oils in Oklahoma to take practically all the available output for March. The Oklahoma market is tighter in this product than some of the competitive areas. Buyers of the 32-36 zero to 10 grade said the first of the week that no material for immediate delivery was available in Oklahoma. The price advanced to a low of 1⅞ cents with sales as high as 2⅛ cents. The 38-40 grade advanced to a low of 2 cents.

Fuels

Any fuel oil which can be blended to make furnace oil is scare. Sales of 28-30, zero to 10 as high as 57½ cents were reported. Price ranges on most grades are unchanged but the market is considered tight for the desirable grades by both buyers and sellers. U.G.I. gas oil has moved up to a low of 1⅛ cents with the best grades selling at 1⅜ cents. High flash straw or dark gas oil of low cold test suitable for blending as furnace oil material has advanced to a low of 1½ cents.

Lubricants and Wax

A majority of Oklahoma and other Mid-Continent manufacturers advanced their quotations on all grades of bright stock 2 cents last week. Prices range from 16¾ cents for 150-160 E and high cold test 150-160 D to 20 cents for 190-200 D. Two Oklahoma manufacturers have shut down their bright stock plants for 30 days and it is understood that there will be some curtailment of output by other manufacturers. Some manufacturers have also advanced their steam refined stocks but the principal grades are still available at prices which range from 3 to 6 cents per gallon. Neutral prices are unchanged.

The demand for wax is sufficient to maintain steady prices. Both export and domestic orders were placed by Oklahoma refiners during the week.

Personal Paragraphs About Oil Men

Lord Glanelly has recently joined the directorate of Lobitos Oilfields, Ltd.

* * *

Clyde Brennan, oil well contractor, has left Casper, Wyo., on a business trip to Chicago.

* * *

R. H. Sloan, of the Humble Oil & Refining Company, has moved from Waco to Jacksonville, Tex.

* * *

J. F. Dornacher, of Massillon, Ohio, is now general manager of the Wyoming High Test Oil Company at Osage, Wyo.

* * *

R. A. Rowlands, of the Standard Oil Company of Indiana, Casper, Wyo., was in Salt Lake City, Utah, recently on a business mission.

* * *

W. J. Bransford, of the Union Oil Company, has been appointed service station auditor of all stations within the Los Angeles, Calif., district.

* * *

K. D. Pardee, of Billings, Mont., superintendent for The Texas Company operations in Montana and Wyoming, was in Casper, Wyo., for a few days.

* * *

E. A. Smith, manager of the Oklahoma Utilities Company's gas properties in the Bristow, Okla., district, has resigned to devote his time to personal affairs.

* * *

H. D. Osborne, of the General Petroleum Corporation, officiated as chairman at the March meeting of the Petroleum Accountants Society held in Los Angeles, Calif.

* * *

C. M. Scott, chief engineer, and J. L. Shoemaker, chief accountant, both of the Stanolind Oil & Gas Company at Tulsa, were recent visitors to the company offices at Fort Worth, Tex.

* * *

L. G. Snow, of Thermopolis, Wyo., district engineer of the U. S. Geological Survey, has returned to Wyoming after a conference of representatives of the mineral leasing division of the U. S. Geological Survey in Washington.

* * *

J. Faber Hanst, of Ralph E. Davis, Inc., engineers, accompanied by Mrs. Hanst, sailed for Europe March 28, and will visit in France and England before returning to the United States. Mr. Hanst expects to return late in April.

* * *

Included among the grants-in-aid made by the National Research Council for the support of research was one to Walter L. Badger, University of Michigan, for investigations on the effect of viscosity on the heat transfer coefficients between metals adn boiling liquids.

* * *

Vic Svimonoff, at one time superintendent of an operating company in the Baku oil field and now in the employ of the General Petroleum Corporation, addressed the spring meeting, California District Division of Production of the American Petroleum Institute in Los Angeles.

* * *

George M. Norman has been appointed manager of the development department of the Hercules Powder Company, Wilmington, Del. Mr. Norman is a director of the company and has been head of the technical department. H. E. Kaiser will supervise research and experiment, and G. E. Ramer will supervise engineering activities.

* * *

Fred S. Seely, for 18 months general superintendent for the Humble Oil & Refining Company in the Permian Basin of West Texas, has been transferred to Tyler, Tex., where he will be in charge of the Humble company's production in East Texas. W. E. Hubbard, of Pampa, superintendent of the Panhandle division, is expected to arrive in McCamey this week to replace Mr. Seeley. J. W. House has been transferred from San Antonio to McCamey to act as assistant superintendent.

F. Melville, refinery superintendent of Trinidad Leaseholds, Ltd., is on leave in England.

* * *

O. E. Stimson, of the Texas Pipe Line Company, has moved from Beaumont to Sour Lake, Tex.

* * *

C. W. Sparr, of Consolidated Royalty Oil Company and president of the Jupiter Oil Company, is motoring from Casper, Wyo., to Texas.

* * *

Ross McCollum, manager of production for the Signal Oil & Gas Company, was recently elected vice president by directors of the company.

* * *

J. R. Reeve, deputy supervisor of the mineral leasing division of the U. S. Geological Survey, Casper, Wyo., is in the Presbyterian Hospital, Chicago undergoing observation and treatment.

* * *

Professor Martelli, professor of geology at the University of Rome, has been appointed president of the Azienda Generale Italiana Petroli to succeed Alberto Giarratana, who has retired.

Men of the Industry

Judd Weber

Judd Weber, superintendent of the Oklahoma pipe lines of the Pure Oil Company, is one of three brothers whose service for that organization totals almost a century. The others are Vice President N. H. Weber, of the Chicago office, and Charles F. Weber, of the Minneapolis office. Judd Weber was born September 26, 1864, in Dempseytown, Pa., a country village 8 miles from Oil City. He worked in his father's store there and eventually acquired a half interest in it.

In 1892 Mr. Weber started out to become an oil man, and the next eight years were passed largely dressing tools in the Ohio and West Virginia fields. In 1900 he became connected with the old Pure Oil Pipe Line Company of Pennsylvania in Butler, Pa. In 1903 he was transferred to Dotter, Pa., which was a relay station on the old pipe line from the Allegheny River to Marcus Hook. He worked for the Pure Oil Pipe Line Company in the East in various capacities until 1919, when he was transferred to Tulsa as superintendent of the company's Oklahoma pipe line, where he has since remained.

Mr. Weber married Miss Henrietta J. Esch, a minister's daughter in Dempseytown, on his twenty-first birthday. They have four sons and four daughters, and 14 grandchildren.

L. D. Wyant, chemical engineer, has returned to Tulsa from France.

* * *

W. A. J. M. van Waterschoot van De Gracht has been appointed temporary director of the Netherlands Bureau of Mines from May 1 next.

* * *

W. H. Strang, deputy supervisor of the mineral leasing division, U. S. Geological Survey, Casper, Wyo., is in New Mexico on a mission for the survey.

* * *

Robert M. Feustel has been made chairman of the West Ohio Gas Company, a member of Midland United Company group, succeeding Samuel Insull, Jr.

* * *

C. L. Baker, of Austin, Tex., presented a paper before the West Texas Geological Society's monthly meeting, at Midland, Tex., on "The History of the Rio Grande."

* * *

Dr. Victor Henny, European representative of the Universal Oil Products Company, Chicago, who has been on a business trip to the United States, has returned to London.

* * *

H. W. Parsons, sales engineer of Speeder Machinery Corporation, Cedar Rapids, Iowa, was in Tulsa and other cities in the Mid-Continent area on business for his company.

* * *

W. M. Keck, president of the Superior Oil Company, has returned to Los Angeles from Sacramento, where he attended a meeting of oil operators called by Governor Rolph of California.

* * *

Frank H. Leovy, vice president of Gulf Oil Corporation, and family of Pittsburgh, Pa., have been spending a few days in the Mid-Continent Field. Mr. Leovy and party visited the Oklahoma City Field during the past week.

* * *

Charles A. Munroe, of New York, president of the New York Oil Company, and the North Central Gas Company, was in Casper, Wyo., for a short time in consultation with local officials. Mr. Munroe is en route home after having completed a trip around the world.

* * *

John F. Cullen, superintendent of the Standard Oil Company refinery at Laramie, Wyo., since 1920, has been promoted to the company offices in Chicago. He has been succeeded at Laramie by F. O. Blair, who has been assistant superintendent for several years.

* * *

John J. McCrae, formerly with the Midwest Refining Company in Casper, Wyo., later with the Stanolind Pipe Line Company, Tulsa, visited in Casper last week. Mr. McCrae will have his headquarters in the future in Fort Worth, Tex., with the Divide Oil Company.

* * *

Frank L. Miller, connected with the R. J. Brown Company, St. Louis, Mo., and widely acquainted among oil men of the Southwest, is in the De Paul Hospital, St. Louis, suffering from illness which is reported as serious. Mr. Miller formerly was identified with the Miller Petroleum Company.

* * *

C. R. Wagner, chief chemist for the Pure Oil Company, gave a short talk before the Oklahoma section of the American Chemical Society in Tulsa and left for New Orleans where he will preside at the meeting of the petroleum division during the annual meeting of the American Chemical Society there.

* * *

Edward G. Meiter, in charge of dust and gas-mask investigations at the Pittsburgh Experiment Station of the U. S. Bureau of Mines, has resigned to assume charge of the newly established Laboratory of Industrial Hygiene of the Employers Mutual Liability Insurance Co., with headquarters in Milwaukee, Wis.

Natural Gas Industry Developments

CHARTER ISSUED TO WILLIAMSPORT COMPANY

WELLSBORO, Pa., Mar. 28.—A charter has been granted to the Williamsport Natural Gas Co., a Pennsylvania corporation capitalized at $500,000. The incorporators, all Williamsport men, are T. R. Adams, Logan Cunningham and R. W. Gilmore. The new company's plans include the purchase of the stock of the Williamsport Oil & Gas Co. and the financing of new drilling operations in both Potter and Tioga Counties. The company will be known as a production company and starts out on an income basis since it becomes owner of producing wells, three of which are now turned into the market, namely the No. 1 Bailey-Pitcher in Wayne, No. 1 Charles Dencenberg, Sr., at Dundee, and No. 1 Charles Dencenberg, same location. The fourth well of the company is on the property owned in fee on a 12-acre woodland purchased from Edward and Helen Allen at Dundee.

The same officers and the same management will serve the Williamsport Natural Gas Co. They are T. R. Adams, president; Logan Cunningham, treasurer, and Robert W. Gilmore, secretary.

The company holds leases located on structure in the Harris-Hebron-Smethport anticlines and in all probability their next operations will be in the Tioga Field. The company has brought in one well this year, the Allen producer.

FEDERAL COURT INVOKED IN MUNDAY, TEXAS, CASE

WICHITA FALLS, Tex., Mar. 28.—A petition has been filed by the Stamford & Western Gas Co. asking the Federal Court to grant an injunction to restrain the city of Munday from interfering with a proposed raise in the present gas rate in that community.

The petition sets out that the present domestic rate in Munday is 85 cents per 1,000 feet for the first 25,000 feet and 75 cents per 1,000 feet above 25,000 feet. There is a monthly service charge of 50 cents and a minimum monthly bill of $2.

The plaintiff alleges that the company is losing money at this rate. The petition states that the investment for pipe lines and a distributing system totals $1,821,423 and that the company is entitled to a return of 10 per cent, or $180,000 annually. The company complains that during 1931 it netted but $29,970.96, or a return of only 1.64 per cent.

It is further set out that the pipe line investment makes a fair gate rate of about 88 cents per 1,000 feet applicable and that under this the distributing company is actually losing money and would have shown a loss of $4,329.34 last year.

It is alleged that the Munday officials refused to permit the company to raise its rates and that the Railroad Commission refused to give the plaintiffs any relief.

NEW SEMINOLE CHARTER

A charter has been issued to the Seminole Citizens' Gas Co., Oklahoma. The application stated the company was organized for the purpose of buying and selling oil and gas properties, obtaining rights of way, establishing pipe line and distribution systems and transporting oil and gas from wells to cities and to towns. Incorporators were R. H. Chase, H. W. Hoffman, H. W. McNeil and W. E. Harber, all of Seminole. The charter was for a 20-year period.

The Corporation Commission now has under consideration a complaint of Seminole citizens against rates charged by the Seminole Gas Co.

USE OF GAS FUEL FOR ELECTRICAL GENERATION

Without losing perspective as to the relative position of the various fuels in industry it may be said that the utilization of natural gas is undergoing a phenomenal expansion. It is becoming an increasingly large factor in the fuel situation of the entire country and this is due primarily to recent discoveries of enormous reserves of this particular fuel and to the development of cheap transmission for it. In fact, the development of pipe line transmission for natural gas has reached a point, says the American Gas Association, where this fuel can be carried from one point to another at less than half the cost of transmitting a similar amount of energy in the form of electricity.

A particularly significant development is its growing use in the generation of electrical power, for the consumption of natural gas in steam electric plants showed a gain of more than 160 per cent in the 11-year period ending with 1930.

This phase of its utilization is well exemplified by the situation in southern California which is served with electricity by the Southern California Edison Co. A few years ago most of the steam-powered generating plants in this territory were considered as stand-by units for the hydroelectric systems, but this position has now been reversed. In fact, the Southern California Edison Co. has already abandoned some of its water-power filings on the creek and rivers in the High Sierras, which it has been holding for future development.

The present tendency toward steam rather than hydroelectric generation is due largely to improvement in steam plant efficiency and in part to the use of the large available supply of fuel—natural gas. The demand for gas for domestic use is very seasonal, being high in the winter and low in the summer. The electric load of the company is high in the summer and low in the winter. This condition, combined with the fact that there is more stream flow hydroelectric power available in the winter presents the possibility of a high annual load factor for gas transmission lines serving the dual purpose of supplying both gas and electric utilities.

The Long Beach plant of the Southern California Edison Co. is the largest central steam electric generating station west of Chicago and with unit 12 now under construction, its capacity will be increased to 515,00 kilowatts, or 690,000 horsepower. Natural gas is brought from Kettleman Hills, a distance of 213 miles, through a pipe line of 26-inch diameter which was completed early in November of this year and which has capacity for 130,000,000 cubic feet in 24 hours. This will take care of the swelling demand for this fuel for some time and the decreasing supply from the Southern Basin fields.

McLEAN CUT UPHELD

AUSTIN, Tex., Mar. 28.—The Railroad Commission, in an order signed by C. V. Terrell and Pat M. Neff, sustained the city ordinance of McLean, Tex., requiring that the rate on natural gas consumption shall be 30 cents for 1,000 feet. The rate was 50 cents, as charged by the McLean Gas Co. When the ordinance became effective the company appealed to the commission. This ordinance was passed August 29 of last year, and under bond arrangements the consumers will be repaid the 20 cents extra for each 1,000 feet since that date. Bond of $6,000 was put up by the company. The 50-cent rate was "unfair and unreasonable" the commission's order read.

MILD WINTER CAUSES GAS CONSUMPTION DROP

Revenues of manufactured and natural gas utilities aggregated $64,915,590 in January, a decline of 11.4 per cent from the preceding year, according to reports to the statistical department of the American Gas Association from companies representing over 90 per cent of the utility distribution of gas.

The manufactured gas companies reported revenues of $33,728,026 for January, a drop of 8.2 per cent, while revenues of the natural gas concerns totaled $31,187,564, or approximately 14 per cent less than for January, 1931.

Sales of manufactured gas reported totaled 32,242,838,000 feet, a decline of 8.1 per cent, while natural gas sales for the month were 70,187,538,000 feet, a drop of 12 per cent. Natural gas sales for industrial purposes declined from 17,778,341,000 feet in January, 1931, to 15,370,712,000 feet in January, 1932, a drop of 13.6 per cent.

A factor contributing materially to the decline in both manufactured and natural gas sales was the abnormally mild temperatures. Sales of manufactured gas for house heating purposes were down nearly 14 per cent for the month, despite a gain of more than 11 per cent over the preceding year in the number of house heating customers.

BAN ON MERCHANDIZING IS APPLIED IN TEXAS

AUSTIN, Tex., Mar. 28.—Appeal of the San Antonio Public Service Co. from a decree of Fifty-third Travis County District Court prohibiting its further engaging in the retail merchandise of gas or electrical appliances, was filed in third Civil Appeals Court at Austin by former Gov. Dan Moody of the company's counsel.

The suit, asking penalties, forfeiture of charter and injunction, was brought by Attorney General Allred on the contention that corporate powers of public utilities do not include invasion of the retail merchandising field, and that their operations in the merchandising field tends to a monopoly. The state's contentions were sustained on a trial, but relief was limited to injunction against further engaging in retail activities.

The attorney general withheld any steps toward preventing the continued operation of merchandising operations by the gas, electrical and other utilities in the state, pending a final decision in the suit by the Texas Supreme Court.

REDUCTION AT ALTAMONT

ALTAMONT, Kans., Mar. 28. — The American Gas Co. with headquarters in Bartlesville, Okla., announced that after April bills have been paid gas bills would be computed on the basis of 35 cents a thousand feet, with no service charge. This is the third reduction since last fall, when the price was 65 cents, with a 75-cent monthly meter service charge.

The city's price schedule is 45 cents a thousand for the first 5,000 feet, 40 cents for the next 15,000 and 35 cents for all gas over 20,000 feet. The municipal plant was completed several weeks ago and 60 families now are buying city gas which comes from local fields.

WINDSOR GAS FRANCHISE

CHATHAM, Ontario, Mar. 28.—The city of Windsor, Ontario, is applying to Charles McCrea, provincial minister of mines, to sanction the granting of a competitive natural gas franchise to the Southern Ontario Gas Co. Windsor is at present served by the Union Gas Co. of Chatham.

PANHANDLE GAS RATE HEARING IN ILLINOIS

SPRINGFIELD, Ill., Mar. 28.—Expert witnesses were heard by the Illinois Commerce Commission in support of the contention by 30 Illinois cities that the rate on Panhandle Illinois Pipe Line natural gas should be reduced between 12 and 20 cents per 1,000 feet, to a basic rate of 48 cents the first year and 30 cents for subsequent years of normal operation.

Witnesses called by the cities were Haymond C. Moore, federal and state geologist of the State of Kansas and head of the department of geology of Kansas University, who conducted an investigation of the gas fields of Kansas for the Kansas Public Service Commission in 1931, and F. G. Holl, Wichita Kans., consulting geologist employed by Kansas in investigating the Amarillo gas fields in Texas and the Hugoton fields of Oklahoma and Kansas.

Their testimony indicated gas reserves of 185,000 acres of proven gas content, controlled by the pipe line company and its affiliated companies, without including gas drained from adjoining areas, were sufficient to serve the Panhandle Pipe Line system at normal capacity for approximately 50 years and at maximum capacity for approximately 35 years. Gas reserves in the Hugoton Field of Kansas and Oklahoma were declared sufficient to meet all needs for 90 years, and reserves in Amarillo Field in Texas were declared sufficient to meet 90 years' demand.

SAN DIEGO FRANCHISE FOR PIPE LINE ASKED

LOS ANGELES, Calif., Mar. 28. — Southern Counties Gas Co., through the pipes of which the San Diego gas company will bring Kettleman Hills gas to San Diego, has applied to the city for a 50-year pipe line franchise. Its communication to the city council asked that formalities in advertising the franchise bids be rushed so that laying of the 80-mile, 14-inch line from near Laguna Beach to connect with the San Diego Consolidated Gas & Electric Co.'s line in Rose Canyon may start as soon as possible.

Authority to buy natural gas from the Southern Counties Co. was asked of the State Railroad Commission by the San Diego company.

Dispatches from San Francisco said a contract filed with the commission showed that the San Diego company plans to purchase gas from the Southern Counties company at the rate of 30 cents per 1,000 feet for domestic and commercial purposes and 12 cents per 1,000 feet for industrial purposes.

KANSAS CITY RATES

KANSAS CITY, Mo., Mar. 28.—An adjustment of gas rates, applicable to patrons using 7,000 feet or more of gas a month but not classed as house heating customers, is being proposed by the Kansas City Gas Co. Approval of the proposal by the Missouri Public Service Commission will be sought soon, it was said.

The proposed rate is $2 for the first 1,000 feet or less per month; $1 a thousand for the next 2,000 feet, and 50 cents a thousand for all in excess of 3,000 feet.

That schedule is the same as the prevailing house heating rate. Users of large quantities of gas, but not using it in furnaces, heretofore have had the same minimum of $2 and $1 a thousand for the next 2,000 feet, but have been paying 60 cents for all over 3,000 feet.

Field Problems and Their Solution

EDITED BY THOMAS F. SMILEY

In order that men connected with the drilling, producing and transporting branches of the petroleum industry may procure quickly a solution of many problems confronting them from time to time in their work, The Oil and Gas Journal has arranged with leading engineers and other recognized authorities to answer questions submitted by readers of this publication pertaining to the work of drilling and producing crude oil and transporting this product.

Everyone is invited to submit questions freely. These questions will be submitted to proper authorities by Mr. Smiley, who edits the page, and answers, based on the best available information, will be published. Each question should give as much detail as possible, especially where it relates to matters where depths of sands, types of sands and operations on adjoining properties would have a bearing on the problem involved. The source of all questions will be considered as confidential and only initials will be published in connection with the question.

In this connection, The Oil and Gas Journal will be glad to publish articles from field men who have devised new methods or practices which are improvements.

In case an immediate answer is important, one will be given by mail if the writer requests it.

USE OF ODORANT IN MAINS

Could you tell me whether the use of stench gases is as effective in finding leaks in distributing mains of gas systems as it is in the service lines? What is usually used as a stench gas? Is it used in some fixed proportion to the volume of gas? Is the piping in an industrial plant more subject to leaks than the piping in a residence? If so, why? May I ask how the stench gas is introduced into the line?—E. R. E.

Reports on the use of odorants for leak detection in gas lines indicate that they are less efficacious in the distributing main than in the service line. The reagent commonly used for this purpose is ethyl mercaptan. The best results are said to have been obtained with a mixture of 7 pounds to each million feet of gas. The rest of your question is answered in a paper prepared by Charles F. Turner, chief chemist of the East Ohio Gas Co., Cleveland, Ohio, from which the following is quoted:

"We have not found the introduction of odorants into natural gas eminently successful as a means of locating leaks in distributing mains. In a more or less experimental way they have been injected into the low pressure side of district regulators with the hope that the odor would assist in tracing leaks in mains and services. Results have been very discouraging. All of the complaints received were from leaks beyond the meter and in the house lines.

"Some three months ago we put into operation an automatic odorizing station on a regulator supplying most of downtown Cleveland, an area of approximately 2 square miles. The amount introducer per 1,000,000 cubic feet can be accurately proportioned. Starting in with a rate of 1 gallon per 1,000,000 cubic feet the amount has been gradually increased in 1 gallon increments until at the present time it has reached 4 gallons per 1,000,000 cubic feet. To date one may count on the fingers of one hand the complaints received. All manner of explanations may be given for the dearth of complaints: Insufficient time; too low a rate; mains not yet saturated; mains, services and appliances all tight. The odor imparted to the gas throughout the district is believed sufficiently noticeable to have caused certain detection of large leaks before this.

"There is one use of odorants which has been attended with highly satisfactory results, that is the inspection of house lines in factories. Piping in many industrial plants is more subject to leakage than in residences or office buildings because of more vibration and exposure, more weight or possible higher pressures. During the past year we have checked approximately 130 factories in Cleveland. The procedure is to tap the service following the meter and then inject odorant by means of an equalized pressure, gravity feed, dropper type lubricator. A close inspection of the lines then brings to light all manner of leaks, big and small. These are marked for repair, a report of their locations is furnished the factory management and after they have had time to effect repairs a second test is made."

OIL PROSPECTS IN AUSTRALIA

I am writing in the hope that you can tell me how to obtain some information relative to the oil industry, particularly regarding geophysics. Has the magnetometer been a success in defining oil structures? Has the torsion balance? We have a considerable area of land situated in various parts of what has been described as the oil basin in Victoria and we are anxious to obtain any information that would be of assistance.—J. B., Victoria, Australia.

A complete report has been prepared by W. G. Woolnough, geological adviser to the Commonwealth government of Australia covering a tour of inspection of the oil fields of the United States of America and Argentina and oil prospects in Australia. This report is published for the government of the Commonwealth of Australia by H. J. Green, government printer, Canberra, and it is priced at 5s. It is an interesting and valuable contribution and it is suggested that you obtain a copy and study it carefully. It gives much good advice in regard to methods to be followed in prospecting for oil in Australia and in applying the methods investigated by Woolnough in this country and Argentina. There is a chapter devoted to geophysics and in it you probably will find the information you desire on geophysical instruments.

You might well correspond with Mr. Woolnough in regard to your particular problems and get direct advice which can be applied to your particular district and be much more reliable than anything offered from this great distance.

If you desire a good book of applied geophysics it is suggested that you get a copy of a book on that subject prepared by the Science Museum, South Kensington, London, S.W. 7. This is an interesting treatise and costs only 2s net. In general it is suggested that any work you may have done be supervised by a geologist, for it is quite necessary to have correct interpretation of magnetometer data to make it of any value, and this can be done best by trained men recognized in their profession.

As Mr. Woolnough has made a special study of methods followed in this country and applied them to conditions in Australia he probably can recommend to you a geologist who could perform any work you might want done.

FOUND PLENTY IN THIS HOLE

The recent experience of A. P. P., a driller in Alberta, Canada, is so interesting that this letter describing it is printed here. In The Oil and Gas Journal of January 14, 1932, was a communication from him as follows:

"Here is a problem in Alberta which is out of the ordinary. A well has 3,800 feet of 6⅝-inch pipe in the hole which cannot be pulled for several reasons, and there is a string of drilling tools and a fishing string—practically 90 feet of tools—150 feet below the pipe, with the hole caving badly. Then there is another string of drilling tools, making three strings in all, cemented in the 6⅝-inch 150 feet up from the bottom of the pipe, or 3,650 feet down. What suggestion can you offer as to the best way of finishing this hole to 5,000 feet, and do you think the tools can be fished out?—A. P. P."

A course of procedure was suggested in response to this request. A. P. P. went to work on his fishing job after obtaining all the information possible that might be of use in his task. That he had a fight on his hands every oil man who reads his letter will agree. He won out. His letter follows:

"I thank you for your co-operation with the fishing job I had here in Alberta. There were two jobs almost alike. The one had a string of tools stuck in the bottom of the 8⅝-inch casing which had just been cemented. The other was described in my former letter.

"Before I went out to this job I was told that there was no use trying to fish out the tools. On the 8⅝-inch job I did follow much the same sidetracking method you suggested, but the men did not have good success because they shot the pipe off after trying everything else they could think of, and to date have their hole about plugged.

"As for the other job I have made a success of it and have surprised myself and friends. I have always prided myself on being able to fish out any string of tools or pipe which I have tackled in my 32 years' experience, although this last job was a bit doubtful. After considerable figuring and experimenting I made a tool and used a process to take the tools out of the pipe including the cement.

"When I ran in to find out just how much cement was in the hole, also the distance to the top of the tools in the 6⅝-inch casing, I found that there was 3,800 feet of pipe in the hole which could not be moved and that the cement was at 3,605 feet and the 1-inch cable in the hole was resting on the tools.

"I made a tool and drilled out the cement around the rope to the tools, which I found at 3,650 feet making 45 feet of solid cement above the tools. There was 52 feet of tools in the pipe in solid cement. After getting the cement out above the tools I cut the cable and ran in with a big stem and blind box and tried to drive the tools down. I drove on them for six days and could not move them so had to figure some other process and finally invented a process to remove the cement and free the tools.

"I then succeeded in knocking them loose and fished them out. After that I started to clean out and discovered a big cave at the bottom of the pipe, with two more strings of tools at 3,920 feet, or 120 feet below the pipe which some of the drillers had lost and cemented in. These being cemented gave me no chance to fish them out. The other fellow had lost his second string trying to get the first string out.

"I doped the hole, drilled by the two strings in it at 3,920 feet and started to make new hole at 4,000 feet. Since then I have been able to continue drilling this 6⅝-inch hole to 5,400 feet. This has never been accomplished in Alberta before owing to the very cavey formations here."

WHY WAS IT CALLED THAT?

VERDIGRIS RIVER

How the Verdigris River, which traverses early oil and gas fields of Kansas and Oklahoma got its name is a subject of occasional discussion. This paragraph found in the Wilson County (Kansas) Sun of July 4, 1894, throws light on the subject:

"A recent authority states that the Indian name of the Verdigris is Wah-set-to-ho, that it is derived from the blue-colored mud found in its banks, resembling verdigris."

The first commercial oil well in the Mid-Continent area was drilled on the west bank of the Verdigris at the eastern edge of Neodesha, Kans.

MEANING OF TERMS EXPLAINED

Two terms that are used a good deal and that are not clear to me are "demand charge" and "load factor." May I ask you to explain what they mean in connection with oil field operations?—A. D. E.

"Demand charge," in the oil business or any other, refers to the things (goods, equipment, material, machinery, employes) that must be kept available all the time, even though they may be in actual service a small part of the time only. "Load factor" refers to the utilization of these things. If men, machinery, etc., are employed to their fullest capacity, we say the load factor is high. Likewise, workmen and machinery that are idle much of the time represent a low load factor. High load factor means efficient operation and low load factor means inefficient operation. This is just as true in the oil field as anywhere else. Men, machines, tools and equipment of various sorts must be kept at hand on the oil lease whether they are needed all the time or not, just to be sure they will be available when the need for them arises.

The electric motor offers an excellent example of what is meant by demand charge and load factor. Four 100-horsepower motors run to full capacity four days out of the month. The rest of the time only two of them run. By the four days' running time a demand rating has been established for which the power company will make a demand charge of approximately 300 kilowatts. At full load the consumption would be in excess of 200,000 kilowatt hours, but on full load four days and half load 26 days the consumption would be only 120,000 kilowatt hours. The demand charge in either case is the same, but on half time the cost per kilowatt hour consumption is 75 per cent more than on full load. At full load the load factor would approach 100 per cent and at half load for 26 days would be about 57 per cent. In the one case, the total bill would have, due to a high load factor, a discount of 20 per cent and in the other only 7 per cent. It is easy to see that such a situation causes the unit cost to mount. The operator not only produces less oil but it costs him more per barrel to get it.

The case of gas engines is probably little different from that of electric motors, only for gas engines it would require intricate cost accounting to arrive at the figures. In like manner, the same is true of equipment, material and men.

Oil Industry Equipment and Supplies

INCORPORATES IDEAS OF PIPE LINE CONTRACTORS

The Highway Trailer Co., Edgerton Wis., is now manufacturing a high capacity pipe boom for the model GH Trackson McCormick-Deering pipe line crawler tractor. This new unit is a side boom of the live type and, in combination with the Model GH tractor will be known as

the Trackson-Highway pipe layer. Its development is the result of field research and the co-operation of pipe line contractors who have been seeking a high efficiency unit without unwieldy size and excess weight.

The ruggedness and compactness of this new combination will appeal to contractors. It performs efficiently in narrow rights of way and close quarters. It has no protruding parts to snag branches of underbrush. The counterweights are placed effectively without being obstructive.

Natural hand-wheel steering and convenient levers permit speedy operation and easy, accurate control. Without stiff-leg, and with the load 2 feet out from the tractor, the lifting capacity is 19,875 pounds. Both boom winch and lifting winch have worm and worm gear drive (29-1), with the safety feature of lowering under power. Power take-off is of a heavy-duty type especially designed for the Model 20 McCormick-Deering and it provides two speeds forward and one reverse.

All castings, including the worm-gear housings, drums and support hanger, are made of electric steel. The whole boom and frame assembly is hot riveted and electric welded. Bolts are used only where disassembly might later be necessary. Full details may be obtained by addressing either the Highway Trailer Co., Edgerton, Wis., or the Trackson Co., 1320 South First Street, Milwaukee, Wis.

TOUGHER THAN OLD TYPE AND HARDNESS RETAINED

The new shape borium put on the market by the Stoody Co., Whittier, Calif., is said to have retained virtually all the hardness of the old-type borium while increasing the toughness and resistance to breakage more than 500 per cent. The shapes are flat, quarter round and half round.

According to the Stoody Co., the new borium shapes have the following characteristics: The hardness is greater than 9 on Moh's scale, will scratch corundum, will cut other metals at temperatures exceeding 3,000° F., is so tough that the new shapes can be used unsupported as lathe tools, etc., and can be used as tips brazed onto shanks; will not crack when a torch is applied and the entire piece can be sunk in molten metal without cracking; cannot be melted with the oxy-acetylene torch and will not alloy or disintegrate when in contact with molten steel.

NOTES ABOUT TRADE LITERATURE

An eight-page bulletin published by the Foster Wheeler Corp., 165 Broadway, New York, on "Vacuum Refrigeration Systems" describes a new method of refrigeration by evaporating, under high vacuum, a portion of the water or brine to be cooled.

Wilson-Snyder multistage pumps for heavy duty and high pressures are the subject of a bulletin issued by Wilson-Snyder, Pittsburgh, Pa.

The Dearborn Chemical Co., 310 South Michigan Avenue, Chicago, is sending out a circular announcing the Dearborn concentration hydrometer for testing boiler water samples.

The Edward Valve & Manufacturing Co., East Chicago, Ind., is mailing a folder about Edward gauge valves.

Bristol's recording absolute pressure gauges are discussed in an illustrated and copyrighted supplementary catalog which may be obtained by addressing the Bristol Co., Waterbury, Conn.

The Acheson Oildag Co., Port Huron, Mich., is mailing to those asking for it a technical bulletin on the mechanics of lubrication with colloidal graphite.

A modern development of particular interest to refiners is treated in a new four-page bulletin entitled "Cooper-Bessemer Gas Engines for Direct-Driving Hot Oil Pumps." The economy of utilizing refinery gas for this type of power is discussed. Three sketches show arrangements and space plans for single and twin-tandem horizontal gas engine drive to hot oil pumps. The Cooper-Bessemer Corp. is distributing the bulletin from the Mount Vernon, Ohio, office and from the various district offices.

An attractive illustrated 40-page catalog, "Rex Moto-Mixers and Agitators for 1932," is being sent on request by the Chain Belt Co., Milwaukee, Wis. It covers moto-mixers, truck mixers and agitators, plant mixers, aggregate elevators, cement elevators, bulk cement unloaders and belt conveyors.

CAMERON IRON WORKS IS INTRODUCING NEW PUMP

The Cameron Iron Works, Inc., 711 Milby Street, Houston, Tex., has announced a new slow-speed, lonog-stroke, straight-lift pump from designs by Tracy Park, of Houston, which is said to have proved highly efficient in lifting fluid from the Texas Gulf Producing Co.'s No. 8-A Kirby at Barbers Hill, Tex. The unit has been in operation since January 16, pumping from the 1,500-foot level of a well more than 6,000 feet deep. The pump has shown an average of more than 300 bbls. per day operating at three strokes per minute, the stroke being 15 feet. A 2¼-inch working barrel, standard A.P.I. standing and traveling valves, and three-quarter inch rods are used.

Construction of the new unit is heavy and simple. Large shafts and roller bearings, with large oil reservoirs throughout requiring little attention, are provided. The unit is furnished by the manufacturer so as to eliminate field fitting or machine work when installing. It consists of two major sections which can be assembled by four men.

Two outstanding features of the new unit are a straight 15-foot lift on the polish rod and marked reduction of jerking of rods, accompanied by smooth reversals made with a pause. The slight pause in action during reversals is obtained through the unique design of the unit.

WELDING STAINLESS STEELS

Cromaloy flux, one of the important items in the line of Oxweld welding fluxes distributed by the Linde Air Products Co., 30 East Forty-second Street, New York, has been developed especially for use in welding the chromium-containing alloys more generally known commercially as stainless steels or rustless irons. Because of the corrosion resisting properties of these chromium-iron alloys, they are being used more and more extensively, and welded products in increasing variety are being fabricated from these alloys. Because of its high solvent power for chromium oxide and its high resistance to heat, Cromaloy flux is especially prepared for this type of work.

DRESSING IS EFFECTIVE AFTER PROTRACTED USE

Griptite, a newly developed dressing for rubber belts, is offered by the Diamond Rubber Co., Akron, Ohio, as neither greasy, inflammable nor harmful to belt or pulley. Its effectiveness is said to increase with use.

The question of belt dressing has been a troublesome one for the rubber belt manufacturer, because belt dressings on the market were intended for leather belts and were compounded with the idea of lubricating the fibers of the belt. Furthermore compounds that soften leather are deleterious to rubber.

The new Griptite belt dressing is made in stick form and rather hard so that it is not easy to apply it too liberally. This virtually removes the danger of building up on the pulleys and also makes for economy in the use of the dressing. With Griptite, the manufacturers say, the transmitting power is doubled immediately upon application on the belting and still further increased after 24 hours of operation.

BELTING SOLD BY THICKNESS

The American Leather Belting Association has decided that for the greater protection of the consumers of leather belting, it should establish and sell this commodity by specifications of thickness instead of weight, thereby discarding the old weight terminology of "ounces per square foot" which can be varied by the mere addition of weighting materials to the leather and does not necessarily represent a differential in transmission values. This decision was reached after the association had canvassed all manufacturers of belting throughout the country. Eighty-one replies were received, all voting for the change. Leather belting prices are based on thickness and this change makes comparatively easy the checking of each piece of belting to see if the average thickness is as ordered.

The purchasing department of the Socony-Vacuum Corp., 26 Broadway, New York, is now making purchases in behalf of the Standard Oil Co. of New York, Inc.; Vacuum Oil Co., Inc.; Socony-Vacuum Specialties, Inc., and the Standard-Vacuum Transportation Co.

"ZEE-METAL" BOLTS ARE PUT TO RIGOROUS TESTS

Completion of an exhaustive series of tests of cast iron "Zee-Metal" bolts is announced by the American Cast Iron Pipe Co., Birmingham, Ala., which states

that this bolt enables it to furnish a 100 per cent cast iron joint in its "Simplex" products, including Mono-Cast Doublex Simplex pipe, Monoloy Doublex Simplex pipe, and Simplex prepared pipe.

In these tests the cast iron "Zee-Metal" bolts are reported to have developed a maximum ultimate tensile strength of 75,000 pounds per square inch, and a minimum "yield point" of 55,000 pounds per square inch, without displaying any tendency to "stretch" or strip the threads. The picture illustrates the perfect threading possible with this bolt, which is provided "finger tight." The bolt has the corrosion resistance of true gray cast iron.

The manufacturer states that the bolts may be expected to broaden the field of usefulness of cast iron pipe.

SENSITIVE PASTE MAKES RECORD OF WATER LEVEL

Gage-o, described as a water-finding paste developed in the laboratories of one of the large oil companies on the Pacific Coast, has been put on the market by the Petroleum Specialty Co., Palo Alto, Calif. Its primary use is in the gauging of water in oil tanks.

Contact with water bleaches the paste, giving it a sharp line at the level of the oil and water interface, since the oil leaves the paste unaffected. An emulsion gives a mottled appearance to the paste on the gauge; but when the oil and water are in cleanly separated strata, Gage-o gives an exact and definite measure of the water level. In gasoline, kerosene, and other light oils five seconds is sufficient time for the test; in heavy gas oil, Diesel oil, and light crude oil 30 seconds will give a clear line; and in heavy crude or residuum a minute is required.

In use the Gage-o is smeared lightly on one side of a clean gauge rod. It is a magenta red color, extremely sensitive to water, and immediately upon contact with water bleaches to an almost perfect white. At the same time it is insensitive to oil in any form and retains its original strength indefinitely when immersed in oil. Thus, it gives an accurate line at the oil-water level in a tank.

Technical Questions Answered

BY CHARLES K. FRANCIS, PH.D., TECHNICAL EDITOR

This department of The Oil and Gas Journal is devoted to the manufacturing branches of the oil industry.

Those connected with the refining of crude petroleum, the manufacture of natural gasoline and closely allied industries are invited to submit their problems to Dr. C. K. Francis, technical editor. The department was created for the purpose of aiding managers, superintendents, engineers, chemists and all those engaged in the various phases of plant operation; also those connected with the marketing and utilization of petroleum products.

Questions should be submitted in as much detail as possible so as to assure a satisfactory answer.

All inquiries should be signed and if other than the given initials are to be used please indicate the desired letters.

Questions involving patented processes, intricate formulas, and calculations and estimates of costs, for obvious reasons, cannot be answered. The replies will appear on this page within a reasonable time.

COMPOSITION REFINERY GAS AND SHALE GAS

Referring to your remarks, February 25, 1932, Page 56, concerning the gas made when cracking oil, could you give the chemical composition of such gas? Do you have an analysis of the gas from shale oil? I am interested to know what is the difference, if any, in these gases.—R. E. B.

The gas made from oil varies to a large extent according to the source and kind of oil cracked and the type of the cracking unit. A similar condition exists with respect to the gas formed from shale oil.

Morrell and Egloff, in Universal Oil Products Co. Booklet 97, give the percentage composition of the gas made from a number of different oils. The range in composition is shown as follows:

REFINERY GAS

Charging stock, gravity A.P.I...	9.7-39.5
Gas—	Per cent
Hydrogen sulphide and carbon dioxide	0-13.9
Unsaturates	2.2-14
Oxygen	0.2-1.9
Carbon monoxide	0.1-3.0
Hydrogen	3.1-10.2
Residue (paraffins and nitrogen)	73-91.2
Specific gravity	0.722-0.960
B.t.u. per cubic foot	1,123-1,702

The composition of the gas from a topped Mid-Continent crude of 28.9 A.P.I. gravity may be fairly representative of the gas made from an oil of good quality. The analysis is from the same reference.

GAS FROM MID-CONTINENT TOPPED CRUDE

Hydrogen sulphide and carbon dioxide	0.7
Unsaturates	5.3
Oxygen	1.1
Carbon monoxide	0.2
Hydrogen	3.8
Residue	86.9
Specific gravity	0.90
B.t.u. per cubic foot	1,650

An important characteristic of the gas from shale oil is the high percentage of nitrogen. Several different analyses of shale oil gas are given by A. W. Nash, Jr., Institute of Petroleum Technologists, 16, 626, 1930. The distillation of a French shale yielded 2,200 feet of gas per ton of shale, the gas containing: Carbon dioxide, 22 per cent; carbon monoxide, 5; hydrocarbons, 40, and hydrogen, 33 per cent. The normal Scottish practice gives about 9,800 feet of gas per ton of shale, a typical analysis being:

GAS FROM SCOTTISH SHALE

	Per cent
Hydrogen sulphide	trace
Carbon dioxide	20.0
Carbon monoxide	4.3
Hydrogen	34.2
Unsaturates	3.1
Methane	10.8
Oxygen	5.1
Nitrogen	22.5
B.t.u.	302.5

The use of steam when retorting shale influences the composition and quantity of the gas. The French shale, above mentioned, yields with steam about 24,000 feet of gas per ton, containing: Carbon dioxide, 20.8 per cent; unsaturates, 0.8; oxygen, 3.6; carbon monoxide, 4.4; methane, 6.6; hydrogen, 25.6; nitrogen, 38.2.

USES FOR NATURAL GAS FUEL

Our company has acquired a natural gas property including wells, pipe lines and franchises. In an effort to build up a more stable consumption we are anxious to investigate all possibilities for commercial and industrial uses of natural gas. If you can give us a list of the more common uses for gas we may be able to find among these one or more which would fit into the communities which we serve.—R. O. G.

The main uses made of natural gas is as a fuel in the industries and as a source of heat in domestic installations. The high heating value, about 1,000 B.t.u. per cubic foot, the convenient form of its distribution, together with the fact that it is free from objectionable impurities and dirt makes it an ideal fuel.

Natural gas is suitable, and is used, for many purposes by various industries. Large volumes are used in the manufacture of portland cement, glass, brick, tile and the smelting of ores. The ceramic industries, including cement, refractories, terra cotta, white wares, and art pottery, are probably the largest consumers of natural gas. It is especially adapted to these because of its purity and the ease with which temperatures may be controlled. A related use is in the manufacture of enameled utensils and sanitary ware. The application of a coating of glass (enamel) to steel has provided a permanent surface which will not corrode and perfectly sanitary. Such applications may be seen in the modern kitchen, table tops, sinks, gas stoves, numerous utensils and the refrigerator.

Natural gas is used in both small and large scale annealing furnaces of many different industries; glass and steel being examples. The automatic equipment for heat treating has been possible with the wide distribution of natural gas. The several steps required for the baking of bread on the large scale of the city bakery are nicely controlled when natural gas is the fuel.

The convenience and the speed with which high temperatures may be reached with natural gas is an advantage long recognized by foundries when melting metals and preparing alloys for castings. The original investment for equipment and the operating cost being especially low for the manufacture of brass castings, lead and lead alloys. The galvanizing operation, the preparation of zinc coated metal, requires large quantities of gas.

There are numerous small scale uses made of natural gas. Some of these are water heaters, radiators, refrigerators, type machines, static removers on printing presses, poultry singers, pressing irons, drying rooms and ovens.

BENZOL BLEND AND HIGH OCTANE GASOLINE COMPARED

In connection with the operation of a fleet of Packards, Buicks, Hudsons and Fords, I can buy 72 octane gasoline at 11.7 cents and 40 per cent benzol blend of the same gasoline at 15.7 cents. This gasoline does not knock in these cars, while the benzol blend tests 90 octane number and this is far in excess. Are there any values to a 40 per cent benzol blend which might make its use advisable even at the higher price?—G. E. M.

The primary purpose for fixing a knock specification for motor gasoline was to make it possible for the informed motorist to obtain a fuel which would give satisfactory performance. A further reason was that if the manufacturer of automobile engines could be assured of an adequate supply and generally available of a nonknocking gasoline, higher compression engines could be made which would be more powerful and more economical. The investigation of the General Motors Corp. demonstrated that the combustion knock was a function of the fuel and a function of the compression of the engine. An increase in compression aggravated the knock in proportion to the magnitude of it. If the engine compression was made high enough, the knock became not only unbearable, but also power consuming. It should be noted that the fuel knock is not simply a slight and hardly audible sound but a distinct, strong and continued knock.

Compression is one of the most important factors controlling economical operation of the automobile engine and this compression is limited by the knocking characteristics of the fuel. Tests indicated that when the compression ratio was raised to 5½ from 4½ an increase in part throttle mileage between 20 and 30 per cent was obtained. The first base line selected by the General Motors workers for grading knock rating was a 40 per cent blend of benzol in a certain type of straightrun gasoline; this untreated gasoline being a very bad knocker. This blend furnished a fuel which gave good performance in the motors of that day. C. F. Kettering, of the General Motors research division, has stated: "There is enough energy in a gallon of gasoline, which if converted 100 per cent to mechanical power, would propel a Ford automobile 450 miles. But I believe the average today (1926) is less than 15 miles; in other words, the conversion factor is about 3½ per cent."

This brief reference to some of the work done in developing the present high knock rating motor fuel is made to bring out the meaning of it all. For some years it was difficult to determine the extent of the knock and the authorities did not have a common unit for expressing it. Now reliable apparatus is available and the unit of measure, octane number, has a definite meaning. The first specification for a premium gasoline covering knock rating was 70 per cent octane, this was increased to 74 and on March 1, 1932, the standard was further increased to 78 octane number. The refiner has learned how to make a high octane number fuel and the engine designer has kept his promise to make an economical and more powerful motor.

The supply of benzol is limited so if it were the standard knock reducing agent there would not be enough of it to meet the demand. There are objections to using large quantities of it because the commercial grade is liable to contain large quantities of gummy material and sulphur. The only property especially desirable for its use in gasoline is its action in reducing the knock.

If the lower priced gasoline makes a satisfactory fuel there is no reason to replace it with the blend costing more.

MIXED GAS FROM REFINERY GAS

What materials are used for making artificial gas as used in cities? What gas is mixed with refinery gas for making gas for industrial and domestic use?—P. M. A.

Consumption of manufactured gas was reported to be 535,000,000,000 cubic feet in 1929. This was made from about 10,000,000 tons of bituminous coal, 433,000 tons of anthracite, and over 950,000,000 gallons of oil.

Mixed gas may be prepared by using several gases that are available in different parts of the country; blast furnace gas, coke oven gas, natural gas and refinery gas are among the important ones. The large quantity of gas, made as a by-product in refineries, is looked upon as a promising source of high heating value gas for mixing with low value gas, especially that known as water gas. The refinery gas displacing the oil when carburetting the gas. Another mixture may contain refinery gas, natural gas and water gas.

Analyses of these gases are shown in the table.

ANALYSES OF GASES

	Refinery	Natural	Reformed	Mixed
Spec. gr.	1.01	0.78	0.81	0.91
B.t.u./cu. ft.	1775	1000	450	1150
	Per cent by volume			
Carbon dioxide	0.4	....	1.7	1.00
Ill'mts.	12.7	....	5.3	9.70
Oxygen	0.0	0.8	0.3	0.13
C'bon mnxide.	1.3	....	10.2	5.47
Hydrogen	2.0	....	9.1	5.33
Methane	34.3	47.0	23.2	29.10
Ethane	49.3	49.2	0.0	26.20
Nitrogen	0.0	3.0	45.8	21.50

It should be noted that refinery gas, as produced, must be purified to bring it within the required specification; however, this may be easily done.

The data presented here are arranged from the bulletin by Alfred Fisher, Universal Oil Products, Co., Chicago.

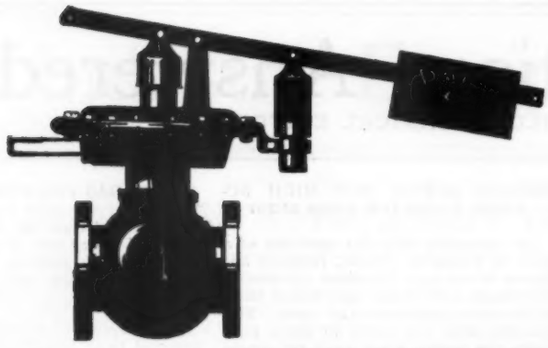
TECHNICAL NAPHTHA

Will you please advise if the term "technical naphtha" applies to a specific product, or if it applies to a group? If the former, what are the required tests, if the latter, what products are so classified?—G. M.

The term "technical naphtha" is applied in a general way to the petroleum fractions usually obtained in the refinery between gasoline and kerosene, and frequently to anything distilling above the kerosene fraction which has not been finished as one of the several recognized grades of gasoline. Some technical naphthas are made from natural gas of suitable quality. The term may be applied to the entire group of naphthas called special naphthas.

The word technical simply indicates a product which has been prepared in suitable form for use in the arts of manufacture. The properties of the special naphtha used in any particular industry must be such that it is suitable for the purpose. Technical, as indicating a grade of naphtha, is applied in a similar way in the description of the condition of chemicals. A chemical compound may be found on the market in two grades of purity, one of which is technically, "commercially pure," and the other is chemically pure. A technical benzol would be the commercial article of 90 per cent purity, but the chemically pure product is 100 per cent benzol.

There are numerous technical naphthas, the several varieties differing considerably in their physical and chemical characteristics. Naphthas used as solvents for gums, those used in the rubber industry, and others as solvents for fats may be mentioned; also, such special grades called Cleaners' Naphtha and V.M.&P. Naphtha.



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SHUT DOWN REFINERIES IN UNITED STATES

The following tables list the shut down refineries in United States as of March 15. The following abbreviations are used: S—skimming; C—cracking; L—lubricating oils; A—asphalt.

Company and plant location—	Crude oil cap.	Crack. cap.	Type of plant	Type of cracking plant
ARIZONA				
Rio Grande Oil Co., Phoenix	1,000	.....	S	
ARKANSAS				
E. M. Tulle Ref., El Dorado	1,000	.....	S	
CALIFORNIA				
Crescent Oil & Ref. Co., Los Angeles	6,000	.....	S	
East West Ref. Co., Los Angeles	1,000	.....	S	
Hart Dearing Ref. Co., Fellows	2,500	.....	S	
Hercules Gasoline Co., Los Angeles	5,500	.....	S-C-A	Jenkins
Holly Oil Co., Huntington Beach	3,000	.....	S	
Orange County Ref. Co., Long Beach	1,000	.....	S	
Petroleum Specialties Co., Los Angeles	2,000	.....	S	
Producers Ref. Co., Kern River	500	.....	L	
Richfield Oil Co., Hynes	55,000	.....	S-C	Cross
Richfield Oil Co., Los Angeles	4,000	.....	S	
Richfield Oil Co., Bakersfield	2,000	.....	S	
Rotary Process Ref. Co., Ltd., Bell	3,000	.....	S-C	Rotary
Seaboard Pet. Corp., Los Angeles	2,000	.....	S	
Signal Oil & Gas Co., Hynes	8,000	.....	S	
Sunset Pacific Oil Co., Los Angeles	8,600	.....	S	
Springs Oil & Ref. Co., Santa Fe Springs	500	.....	S	
The Texas Company (Calif.), Coalinga	500	.....	S	
Union Pacific Oil Co., Long Beach	2,500	.....	S	
Wilshire Oil Co., Fellows	2,500	.....	S	
ILLINOIS				
Barber Asphalt Co., Madison	700	.....	A	
Henry H. Cross Co., Dupo	1,000	.....	S	
Interocean Ref. Co., McCook	5,000	.....	S-L	
INDIANA				
Portland Oil & Ref. Co., Portland	600	.....	S	
Interstate Gasoline Co., East Chicago	2,500	.....	S	
IOWA				
Mona Motor Oil Co.	1,500	.....	S	
KANSAS				
Grant Oil Co., Augusta	2,500	.....	S	
Hutchinson Oil & Ref. Co., Hutchinson	2,500	.....	S-C	
Richardson Ref. Co., Eldorado	1,500	.....	S	
Sinclair Ref. Co., Argentine	11,000	.....	S-C	Isom
KENTUCKY				
Central Prod. & Ref. Co., Bowling Green	600	.....	S	
Great Southern Ref. Co., Lexington	2,500	.....	S-L	
Neha Ref. Co., Lexington	800	.....	S	
Standard Oil Co. of Ky., Louisville	5,000	.....	S-C	Burton
LOUISIANA				
Crystal Oil Ref. Co., Shreveport	10,000	.....	S-C	Jenkins
Great Southern Ref. Co., Ardis	2,000	.....	S	
Red River Ref. Co., Crichton	1,800	.....	S	
Sinclair Ref. Co., Meraux	30,000	.....	A	
MARYLAND				
Interocean Oil Co., Baltimore	7,000	.....	S-C	Leamon
MICHIGAN				
Henry H. Cross Co., Muskegon	2,000	.....	S	
Standard Oil Co. (Indiana), Zilwaukee	1,500	.....	S	
MONTANA				
American Ref. Co., Great Falls	1,000	.....	S	
Laurel Oil & Ref. Co., Laurel	5,000	.....	S-C	Donnelly
Montana Ref. Co., Billings	750	.....	S	
Round Up Oil & Ref. Co., Butte	200	.....	S	
Sunburst Oil & Ref. Co., Great Falls	2,500	.....	S	
NEW MEXICO				
Bloomfield Oil & Gas Co., Bloomfield	300	.....	S	
State Oil & Ref. Co., Dayton	2,500	.....	S	
Sullivan Refs., Inc., Dayton	1,500	.....	S	
OHIO				
Craig Oil Co., Toledo	1,500	.....	S-L	
Rajah Oil & Ref. Co., Youngstown	500	.....	S	
OKLAHOMA				
Canfield Oil Co., Yale	400	.....	S-L	
Carter Oil Co., Cartoco	5,000	.....	S	
Century Pet. Co., Tulsa	2,000	.....	S	
Chestnut & Smith Corp., Sand Springs	5,000	.....	S	
Electrol Ref. Co., Oklahoma City	2,000	.....	S	
Empire Oil & Ref. Co., Cushing	5,000	.....	S-C	Doherty
Gilmer Oil Co., Ringling	1,000	.....	S	
Globe Oil & Ref. Co., Cushing	2,500	.....	C	
Illinois Oil Co., Cushing	3,000	.....	S-C	Donnelly
Imperial Ref. Co., Ardmore	4,000	.....	S-C	Dubbs
Interocean Oil Co., Bristow	3,000	.....	S	
McCullough Oil Co., Oklahoma City	2,000	.....	S	
Morgan Petroleum Co., Tonkawa	3,000	.....	S	
Peppers Gasoline Co., Covington	1,000	.....	S	
Producers & Refiners Corp., Cushing	2,500	.....	S	
Santa Fe Oil & Ref. Co., Ardmore	5,000	.....	S	
Superior Oil Corp., Grandfield	2,000	.....	S	
Texas Pacific Coal & Oil Co., Wynnewood	3,000	.....	S-C	Dubbs
Walters Ref. Co., Walters	2,500	.....	S	
York Ref. Co., Oklahoma City	3,000	.....	S	

SHUT DOWN REFINERIES IN UNITED STATES

Company and plant location—	Crude oil cap.	Crack. cap.	Type of plant	Type of cracking plant
PENNSYLVANIA				
Conewango Ref. Co., Langdale Switch	2,000	.....	S	
Freedom Oil Works, Coraopolis	500	.....	S-L	
Island Pet. Co., Neville	1,000	.....	S-L	
North Penn Ref. Co., Tiona	500	.....	S-L	
Swan-Finch Ref. Corp., Warren	1,000	.....	Comp.	
Titusville Oil Works, Titusville	1,000	.....	S-L-C	Titusville
Viking Oil Corp., Clarendon	2,000	.....	S-L	
Waverly Oil Works Co., Coraopolis	3,000	.....	S-C	Cross
TENNESSEE				
Nashville Oil Co., Nashville	500	.....	S	
Urania Pet. Co., Ltd., Memphis	500	.....	S	
TEXAS				
American Ref. Properties, Wichita Falls	5,000	.....	S-C	Dubbs
Apache Ref. Co., Sunray	4,000	.....	S	
Atlantic, Pacific & Gulf Ref. Co., Wichita Falls	5,000	.....	S-C	Jenkins
Bobrose Oil & Ref. Co. (Deer), Luling	3,000	.....	S	
Bobrose Oil & Ref. Co., Brownwood	1,000	.....	S	
Central Ref. Co., Friars Switch	10,000	.....	S	
Constantin Ref. Co., Overton	3,000	.....	S	
Crystal Oil Corp., Burkburnett	1,000	.....	S	
Dale Oil & Ref. Co., Electra	4,000	.....	S	
Ewno Oil Corp., Luling	2,500	.....	S	
Foster & Co., Denison	600	.....	S	
Four States Refining Co., Texarkana	700	.....	S	
Freeport Asphalt Co., Freeport	5,000	.....	S-A	
Golden West Oil Co., Hondo	150	.....	L	
Great West Ref. Co., Big Spring	5,000	.....	S	
Humble Oil & Ref. Co., Houston	3,000	.....	S-A	
Humble Oil & Ref. Co., Breckenridge	1,500	.....	S	
Iowa Park Prod. & Ref. Co., Iowa Park	2,500	.....	S	
Kent Ref. Co., Angus	4,000	.....	S	
Kent Ref. Co., Minerva	2,200	.....	S	
La Salle Pet. Corp., Burkburnett	3,000	.....	S-C	Jenkins
Magnolia Pet. Co., Magpetco	10,000	.....	S	
Mid-Tex Ref. Co., Midland	2,500	.....	S	
Macmillan Pet. Corp., Borger	8,000	.....	S	
Motor Fuel Products Co., Laredo	2,000	.....	S-C	Jenkins
Nacogdoches Ref., Inc., Nacogdoches	500	.....	S-L	
Norgold Ref. Co., Olney	1,000	.....	S	
Petroleum Conversion Corp., Texas City	3,000	.....	C	T. Y. D.
Petroleum Refractionating Corp., Longview	15,000	.....	S	
Richardson Ref. Co., Big Spring	7,500	.....	S-C	Jenkins
Seymour Ref. Co., Seymour	250	.....	S	
Slack Pet. Corp., Willow Spring	2,500	.....	S-C	Slack
Southland Ref. Co., Olney	1,000	.....	S	
Superior Ref. Co., Tiffin	2,000	.....	S	
Sweetwater Oil & Ref. Co., Sweetwater	1,000	.....	S	
Taxman Ref. Co., Wichita Falls	2,500	.....	S	
Tonkawa Pet. Co., Pyote	4,000	.....	S	
Western Oil Corp., Burkburnett	3,000	.....	S	
Young Ref. Co., Archer City	250	.....	S	
WASHINGTON				
Inland Empire Ref. Co., Parkwater	500	.....	S	
Spokane Oil & Ref. Co., Hillyard	1,000	.....	S	
WYOMING				
Alliance Oil & Ref. Co., Thermopolis	1,500	.....	S	
Eclipse Oil & Ref. Co., Newcastle	40	.....	S	
Lovell Ref. Co., Lovell	600	.....	S	
The Texas Company, Cody	3,000	.....	S-C	Holmes-Manley

LABORATORY PERMITS ALL TYPES RESEARCH

(Continued from Page 85)

also are air compressors, vacuum pumps, motor generators, a switchboard, etc.

Most interesting to the layman in the automotive division laboratories, however, is the series of dynamometer rooms and cold rooms. There are seven cold rooms —one of the latter being of unusual size and accommodating a chassis dynamometer known to the workmen as "the bullwheel."

Each dynamometer room and each cold room is insulated as to heat and sound and each is lined with sound-absorbing material which materially increases the comfort of the men assigned to work in them. Each of these rooms is provided with conditioned air so that temperature and relative humidity are always under exact control.

Between each dynamometer room and its associated cold room is a window, made of several layers of glass well separated. Chemicals between the layers prevent the condensation of moisture on the glass. The dynamometers are arranged to operate on engines mounted either in the dynamometer room or the associated cold room. One five-ton dynamometer is so arranged as to operate either as a chassis dynamometer or a block dynamometer and in either of two positions. It can be moved from one position to another.

Temperatures as low as 20° below zero and any degree of relative humidity can be obtained in any cold room. Although called "cold rooms" they may also serve as hot rooms, for the temperature of any of these rooms can be increased to 150°. One room may be heated to temperatures in excess of 180° —and this without material leakage of heat to other rooms where subzero temperatures may be desired.

The bunker system of refrigeration is employed. Instead of exposing cooling pipes in each room, air, chilled to the desired temperature, is blown into the room, the temperature being maintained automatically at any point desired. Each room is independently controlled but the system is so devised that an excess of cold air may be diverted from one room to overcome difficulties which might arise in another due to the radiation of heat from an overloaded engine under test.

The largest cold room is 14'x41' and this contains the large wheels of the chassis dynamometer — the "bullwheel" previously mentioned. This room is large

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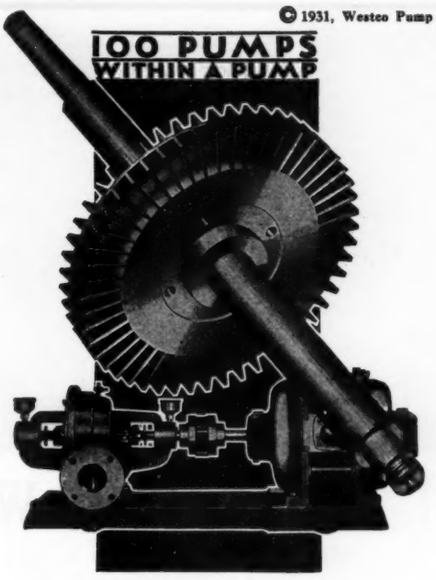

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the effectiveness of centrifugal force

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Then too, the capacity delivered by a Westco practically always remains the same. This is true even though suction or discharge pressures might vary considerably. The Westco Turbine Pump *automatically adjusts* itself to changes in the operating condition.

There is no metal-to-metal contact inside Westco's pump chamber so that friction occurs *only* from the liquid coming in contact with the impeller and pump castings. This feature makes Westco particularly ideal for handling non-lubricating liquids.

This simple, sound Turbine-type Pump has *only* one moving part—its impeller. Such utter simplicity and small metal requirements make it possible for Westco to be most economically built from non-corrosive metal alloys.

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4. Entire absence of vibration.
5. No end-thrust due to perfect hydraulic balance.
6. Ball-bearing construction.
7. Only one moving part.
8. Higher pressures in single stage.
9. Can be directly connected to turbine or motor.
10. Compact—minimum floor space required.
11. Pump interior readily accessible without disturbing suction or discharge connections.

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enough to permit chassis tests to be made of the largest automotive vehicle manufactured. This room is so placed in relation to one of the smaller cold rooms that the two may be thrown into one to accommodate an automobile as long as 40 feet—if one that long is ever manufactured.

So well are the rooms insulated as to sound and heat that a powerful engine operating at high speed in one room cannot be heard in an adjoining room.

Economy of space as well as of expenditure arises from the fact that the electric generator which is the most essential feature of a dynamometer can also operate as an electric motor. This makes the equipment available for a wide variety of uses. The power generated during these tests was formerly wasted or dissipated as heat, but now it is utilized.

In certain tests power up to 200 K.V.A. (265 horsepower) can be turned back into the lines for useful work in the research area or in the plant.

In this building are many others, possibly less impressive, but not less important devices used in the study of automotive operation, automotive fuels and lubricants. Included are dragometers, lubricating film testing devices and other "set-ups." Five rooms, for example, are devoted to the apparatus used in the study of motor fuels. Included are knock-testing engines of various designs.

Alternating current is received from the main power plant at the Paulsboro works, half a mile away, at 2,300 volts. It is stepped down from this high voltage to 220 volts and 110 volts for the various apparatus. In these transformers the research area has a total capacity of 825 K.V.A. Provision is also made for changing the alternating current to direct current for certain operations. The electrical system is so arranged that repairs may be made without interfering with tests that demand continuity of operation. This is most important as some studies require uninterrupted operation of test apparatus for many days or even weeks.

Practically all of the conduits and wiring are concealed. Approximately 30,000 feet of conduit were used in the work.

Much thought was given to making the laboratories safe and healthful places in which to work. Not only the need for exact control of temperature and humidity in the dynamometer rooms and in various tests and studies but the comfort and health of the men engaged in this work prompted the installation of air conditioning apparatus.

Much thought has been given to the carrying away of objectionable and dangerous fumes. Not only are engines under test arranged to exhaust into ducts but even the service pits are ventilated by ducts appropriately placed. Gasoline containers are equipped with devices which, in case of fire, permit the gasoline to discharge through pipes into places of safety.

One of the most interesting safety devices is not visible. The cold rooms are on the side of the building and the outside wall of each room is purposely weakened so that, in case of an explosion within the room, it would offer low resistance. While we have never had a serious explosion in a cold room, the experience of others indicated the wisdom of adopting this effective and interesting method of safeguarding our workers.

INCREASED SIGNIFICANCE OF OLEFIN HYDROCARBONS

(Continued from Page 88)

erably better engine performance than paraffinic spirits. This fact indicates that olefin hydrocarbons are not so liable to knock as the normal paraffins and finds confirmation from the knock rating of pure hydrocarbons. In actual anti-knock values[19] the olefins vary according to their chemical structure. In a homologous series of straight-chain olefins, apart from the lowest members, the tendency to knock rises with the length of the saturated carbon chain. With isomerides this tendency decreases progressively with centralization of the double linking. The tendency to knock is roughly determined by the length of the longest saturated carbon chain. With branched chain olefins the tendency to knock is related to the position of the double linking and to the structure of the molecule.

Liquid olefins with more than one double linking probably have very good knock ratings but must be removed from petrol when their gumming tendencies are too pronounced. The isolation of some di-olefins from vapor-phase cracked spirit has recently been described[22].

Relation Between Vapor-Phase Oxidation and Knock Rating

The engine performance of a hydrocarbon as a fuel in an internal combustion engine is related to its behavior under vapor-phase oxidation conditions. Mardles[20] has reviewed the vapor-phase oxidation of many hydrocarbons, including olefins, in the presence and absence of oxidation inhibitors such as lead tetraethyl. The study of the kinetics of the oxidation of fuel vapors in air showed that these fuel vapors which react relatively slowly and have a low temperature coefficient usually possess antiknock properties, while normal paraffins and other proknock substances have high temperature coefficients of gaseous reaction. Inhibitors invariably reduce the amount of peroxidation and so lower the temperature coefficient of oxidation.

Polymerization of Olefins and Condensation With Aromatic Hydrocarbons to Form Synthetic Lubricants

The polymerization of olefin hydrocarbons can be effected by the following influences: Ultraviolet light, silent electric discharge, heat, pressure, and catalysts. Of these, two processes are perhaps of outstanding interest, namely, the action of silent electric discharge and the action of catalysts. Collie[21] was one of the earliest workers on the effect of the silent electric discharge, and obtained liquid hydrocarbons from ethylene. Later workers[23] subjected ethylene to a silent discharge of 12,000-13,000 volts and obtained a mobile yellow oil.

This principle is the basis of the Electron oils and Voltols, which are mineral and fatty lubricating oils increased in viscosity by such treatment[24]. By the action of the silent electric discharge, hydrogen is split off molecules and the residues combine to form more complex molecules.

The use of catalysts and increased pressure upon the polymerization of olefins presents a fruitful field for research. Aluminum chloride and boron triflvoride are important catalysts for causing olefin polymerization. With aluminium chloride, there is every reason to believe that reactions of the Friedel-Craft type occur, as it is known that unsaturated hydrocarbons such as ethylene can undergo this reaction with other substances to produce alkylated aromatic hydrocarbons, alkyl vinyl ketones, halogenated acid chlorides, etc[25]. These synthetic lubricating oils produced from ethylene and other olefins by the action of aluminium chloride have been reviewed by the author[25], and by Sullivan, Voorhees, Neeley and Shankland[26]. These oils show some remarkable similarities to natural petroleum lubricating oils yet have some differences in properties from them.

Many patents cover the formation of synthetic lubricating oils by the condensation of olefins with aromatic hydrocarbons in the presence of aluminum chloride.

An analogous reaction has been employed for a recently described synthetic lubricating oil[27] which is used for blending with natural petroleum lubricating

[19]Lovell, Campbell and Boyd, Ind. Eng Chem., 1931, 23, 555.

[20]Birch and Scott, Ind. Eng. Chem., 1932, 24, 49.

[21]Trans. Farady Soc., 1931, 27, 681.

[22]J.C.S., 1905, 87, 1,540.

[23]Demjanov and Prianischnikov, J. Russ. Phys. Chem. Soc., 1926, 58, 462.

[24]Isom, The Oil and Gas Journal, August 20, 1925, Page 156; De. Hemptinne, U.S.P. 970,473.

[25]Stanley, J.S.C.I., 1930, 49, 349; T.&J.I.P.T., 1929, 15, 516.

[26]Bowen, The Oil and Gas Journal, 1931, March 5, Page 209.

[27]Ind. Eng. Chem., 1931, 23, 604.

[27]U.S.P., 1,815,022.

oils to lower their pourpoint, the reaction in this case being a low temperature condensation of a monochlor paraffin wax and a solid aromatic hydrocarbon such as naphthalene, by means of aluminum chloride.

There is no immediate likelihood of large amounts of these olefin polymers appearing on the market owing to the abundance of natural petroleum lubricating oils, but such synthetic oils will, without doubt, find uses for which their special characteristics fit them.

HYDROGENATION SOLVES AIRPLANE FUEL PROBLEM

(Continued from Page 90)

buretor, or in an auxiliary mixing device or primer for starting.

3. Use of an auxiliary atomizing or vaporizing device to produce a fuel mixture capable of air flotation during cranking of the engine. The simplest form of such device is an electric heater. The next simplest form is, perhaps, an auxiliary atomizing jet with auxiliary spark ignition producing partial combustion which results, first, in vaporization and then in condensation to a fog or mist of unconsumed liquid.

4. Complete redesign of the carburetion and distribution system.

Market for Safety Fuel

It is difficult to estimate the potential demand for safety fuel. There is pressing demand for safety fuel for general use in passenger aircraft especially those of the cabin type. The largest present demand, however, is for marine use divided into two categories, first, for small launches and cabin cruisers and, second, for auxiliary engines in larger craft operated on fuel oil or Diesel oil in their main power plants. Both designers and users of equipment in all of these classifications are actively interested in the subject. A considerable number of tests have already been made with the limited quantities of the new safety fuel which have been available for such purposes. The product is now being turned out in a semicommercial hydrogenation unit which will give supplies sufficient for unlimited development work.

The practical importance of the new fuel is indicated by the following comments occurring in an article in "The Bee-Hive" of the Pratt & Whitney Aircraft Co.:

"The perfection of the fuel injection feature is an important step toward the utilization of less inflammable fuels such as the hydrogenated or safety fuel. This latter has been produced and has undergone exhaustive experimentation by the technicians of the Standard Oil Co. of New Jersey, according to A. V. D. Willgoos, our chief engineer. It is believed that future developments of the injection model will use such fuels with the same efficiency as gasoline. The low inflammability of this combustion material will greatly reduce fire hazard in aircraft operation. Also it has shown an increase in power amounting to approximately 10 per cent in the series of tests conducted by N.A.C.A. engineers. It is produced by the hydrogenation process with particular attention to high flash qualities, and has an octane rating of 82.6 without the addition of any knock suppressor. Experiments have indicated that fuels produced by the hydrogenation process have inherent antiknock value—a much to be desired characteristic for the present-day so-called 'gasoline engine.' The temperature at which the fuel will ignite is +107° F. as compared with the flashpoint of ordinary gas, which is anywhere from —26° F.[1] to —46° F.[1]"

So far as appears, there will be no difficulty in providing commercial supplies of the new fuel at a rate in advance of market demand. With small demand and limited distribution, expenses of both production and distribution will be somewhat higher than present fuels in large demand. The intrinsic cost of the safety fuel is, however, well within the limits of its demonstrated economic value.

[1]These flashpoints are very conservative.

NEW VISCOSIMETER YIELDS VITAL DATA

(Continued from Page 96)

sures higher than the internal pressure, thus maintaining a seal. For further comments on Bridgman's developments in high pressure construction, see his original discussion (3).

The data are given graphically and were obtained on worked greases (60 strokes in the A.S.T.M. grease churn) at one temperature, 77° F. (25° C.).

By definition, the rate of shear is calculated by the formula

$$S = \frac{4V/t}{\pi R^3}$$

while the stress is given by

$$F = \frac{PR}{2L}$$

and the apparent viscosity is given by the formula

$$\eta a = \frac{F}{S}$$

where

ηa = apparent viscosity, poises.
P = pressure, dynes per c.m.^{2}
R = radius of capillary, c.m.
L = length of capillary, c.m.
V/t = rate of efflux, c.m.^{3} per second.
F = stress, dynes per c.m.^{2}
S = rate of shear, seconds.$^{-1}$

For oils the value of apparent viscosity is constant, that is independent of the rate of shear.

Figure 3 is an apparent viscosity-rate of shear diagram of a series of cup greases (calcium soaps of mixed fatty acids in mineral oil) containing the same oil, but varying amounts of soap.

Figure 4 is an apparent viscosity-rate of shear diagram of the data on two cup greases and a pulp oil (aluminum oleate soap in mineral oil), all containing a paraffin oil of lower viscosity than that in the greases shown in Figure 3.

It must be emphasized that the charts are logarithmic. The extreme variations in apparent viscosity should be noted. For instance, the apparent viscosity of Grease 6 (Figure 3) was 100,000 poises at a rate of shear of 0.1 second^{-1}, and only 8.4 poises at 100,000 seconds^{-1}, as compared with the oil having a constant viscosity of 1.2 poises, at the fixed temperature 77° F.

A survey of Figures 3 and 4 serves to demonstrate beyond any doubt that, as the rate of shear increases, the apparent viscosity of the grease approaches some limiting value, higher than, but of the same order of magnitude as that of the oil in the grease. This may seem obvious, even in the absence of the data, but does not seem to be universally accepted.

To illustrate, certain invesigators were surprised to find that, while the initial torque of ball bearings freshly filled with the proper grease was dependent on the consistency—in other words, on apparent viscosity at low rates of shear—the torque and rise in temperature at equilibrium conditions were primarily dependent upon the viscosity of the oil in the grease. These findings are obvious in light of the diagrams given.

In general, the apparent viscosity at low rates of shear governs the dispensing and feeding characteristics of the lubricant, and diagrams such as Figure 3 may be used to predict what changes would be effected by certain changes in the grease. For example, if a certain piece of dispensing equipment used on Grease 3 (Figure 3) required pressure of 200 pounds per square inch at the drum, and it was desired to change to Grease 4, and the rate of shear was known to be approximately 100 seconds^{-1}, the pressure required for Grease 4 could be calculated as follows:

$$\frac{145}{52} \times 200 \text{ lbs. per sq. in.} = 560 \text{ lbs. per sq. in.}$$

The values 145 and 52 are the apparent

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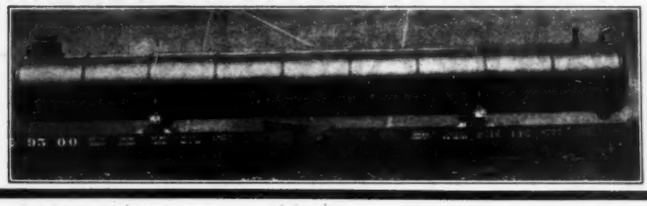

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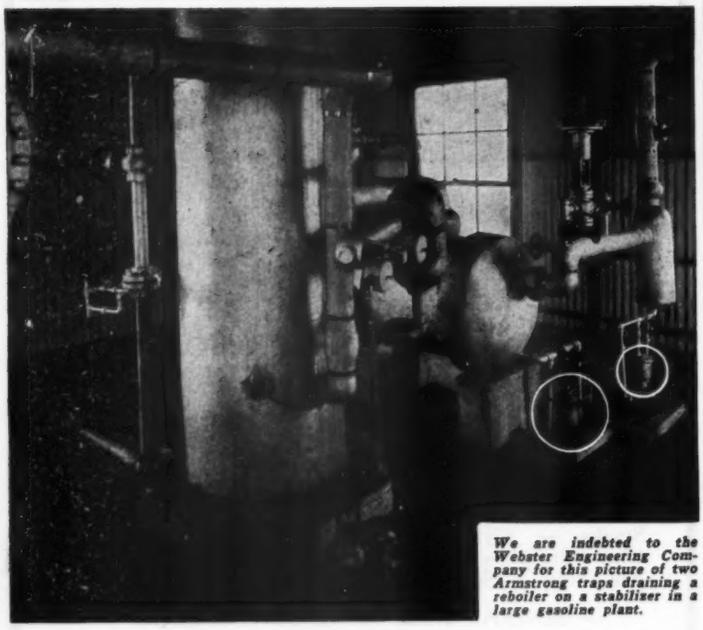

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viscosities of Greases 4 and 3, respectively.

The similarity in shape of the curves fortunately makes the accurate estimation of the rate of shear unnecessary in this type of problem where a change between greases of one class is involved. In the above example if the rate of shear should have been either 40 or 400 seconds^{-1}, the pressures required for Grease 4 would be 630 and 475 pounds per square inch, respectively. With the lower and upper ranges of rate of shear fixed by the requirements of use, that grease having the lowest apparent viscosity at intermediate ranges of rate of shear at the temperature of operation will be the most economical of power in bath-type lubrication.

Is There One General Relation for Each Kind of Soap?

A close examination of the curves in Figure 3 suggests that they may all be part of one general relation, which is characteristic of each class, and involves, besides the rate of shear, factors characteristic of the oil and soap. It is impossible to set up this relation at the present time, but, as additional data are accumulated, it is expected that such general relations may be evolved which will be characteristic of greases of a given type.

Conception of Grease Structure

In the course of this work it was noticed that lime-soap greases, which can be worked to substantially constant consistency in the A.S.T.M. grease churn, could be forced through the capillary of the viscometer without any noticeable additional loss in consistency. This was true even when very high rates of shear were employed. Further, the curves expressing the relation between the apparent viscosity and the rate of shear (see Figures 3 and 4) are obviously members of a definite system which could not well exist if actual severing of elements of the structure occurred. This behavior suggests that the structure of a lime-soap grease may consist of the interlacing of flexible solid members, which may be in themselves deformed or merely separated by the shearing action, but which are not actually ruptured. In other words, any shearing action merely distorts the individual members and reduces the average amount of interlacing, which accounts for the tendency toward working to a constant consistency representing the condition of maximum possible deformation of the members under that particular shearing condition. If, furthermore, the members be elastic, they will tend, after severe deformation, to assume their previous forms. This, in general, explains the fact that a worked grease approaches a limiting value at very high rates of shear—the lowest conceivable limit being at least slightly above the viscosity of the oil—but resumes its worked consistency immediately upon issuing from the capillary. Elasticity of the members surrounded by a viscous medium would also explain the tendency of worked lime-soap greases to increase in consistency on aging.

The common soda-soap greases have much longer and coarser structures than do the lime-soap greases, as is evidenced by their fibrous nature, opacity, and tendency to leak oil in storage. On working, these greases do not give constant penetrations in 60 strokes in the A.S.T.M. grease churn, but work down to very thin, less fibrous, products. It appears then that the individual structural members of these greases differ in size, shape, and structural strength from those of the lime-soap greases and are apparently actually ruptured on working.

The whole picture seems to tie together in the manner which indicates that further work would be very productive. At present work is underway wherein the temperature is an added variable. It is the author's hope that he has suggested and described an effective tool for the study of the behavior of petroleum lubricating greases and that he has demonstrated that the information obtained therefrom is extremely useful.

(1) Barr, "Monograph on Viscosimetry," Oxford University Press, London, 1931.

(2) Bingham, "Fluidity and Plasticity," McGraw-Hill, 1922.

(3) Bridgman, Proc. Am. Acad. Arts Sci., 49, 627-43 (1913-14).

(4) Buckingham, Proc. Am. Soc. Testing Materials, 21, 1,154 (1921).

(5) Bulkely and Bitner, Bur. Standards J. Research, 5, 83 (1930).

(6) Hatschek, "Viscosity of Liquids," Van Nostrand, 1928.

(7) Reiner, J. Rheology, 1, 11 (1929).

(8) Waele, de, J. Oil Colour Chem. Assocn., 6, 33 (1923).

(9) Williamson, Ind. Eng. Chem., 21, 1,108 (1929).

EXPLAIN SPECIFICATION METHOD OF PURCHASING

(Continued from Page 98)

Mid-Continent oils would meet Kansas specifications. From the data shown in Table 2 and taking as an example the compounding of an oil to meet the specifications required in Grade BB, medium, as given in Table 1, a mixture containing about 20 to 30 per cent bright stock or base and 70 to 80 per cent neutral is required to produce a viscosity of 185 to 220 seconds at 130° F. The other probable characteristics of such a mixture as read from Table 2 show the gravity to be about 26° F, the carbon residue about 0.50 per cent, the cold test about 4° F., the flashpoint about 400° F., the fire 485° F., and the color about 5 A.P.I. Such an oil would therefore meet the requirements of the specifications; in fact, following a similar method it will be found that all oils specified in Table 1, with the possible exception of the Grade A light, could be made up of various proportions of this base and neutral oils.

Undoubtedly, combinations of several other base and neutral oils would likewise meet these specifications. Because of the rather high cold test as specified in Table 1 it would be entirely possible to meet these specifications with a base oil of higher cold test than was used in the preparation of the data shown in Table 2.

One of the important facts seen in Figures 1, 2 and 3 is that with the possible exception of the cold test, the color, the carbon residue, and the gravity all the characteristics of a compounded oil vary in something other than a straight line proportion. This fact is often overlooked by contractors in compounding an oil and as a result a great deal of difficulty is experienced in compounding an oil to meet the specifications. The contractor could eliminate a great deal of this difficulty by studying the resulting characteristics of compounding. It is an expensive experiment for a contractor to submit oils compounded in a haphazard manner when he knows that a rigid check-up on the submitted oil will be made.

The success in purchasing lubricating oils by specifications lies in accurate tests of the oils submitted under the contract. This requires that each barrel or drum should be sampled and a test made. This procedure adds materially to the cost of the oil. The cost of sampling and shipment of oil to the laboratory for test is an item in itself. The actual cost of analysis will vary between $2 and $4 per sample depending upon the rate of pay of a good laboratory assistant. This item alone increases the cost per gallon about 5 to 10 cents above the contracted price if the shipments are made in barrels or drums.

If asked whether or not the purchase of oils by specifications was practical, the experience of the State of Kansas shows that it is. There are, however, certain special conditions that are necessary to make this system of purchasing lubricants possible.

Purchasing oils by specifications is not adapted to the purchase of oils in small quantities. It is best adapted to cases where large quantities of oils are used and where the equipment to be lubricated is such that only a small number of different grades of lubricants are necessary. It is best adapted to systems of management where the sampling and testing of the oils submitted can be carefully su-

pervised and especially in organizations where laboratory facilities are available for testing lubricants. It is not well adapted to the purchase of commercial or well advertised lubricants for the characteristics of such lubricants cover too wide a range. It requires considerable study of the characteristics of all base and neutral oils and the general trend in the advancements made in the science of lubrication. It requires a constant study of the changes being made in mechanical equipment, especially as those changes effect lubrication.

It may be said in general that few organizations are so equipped as to make the purchase of lubricating oils by specifications practical. Those that can do so, however, will find that the system has a great many disadvantages, but enough advantages as to make the system worth while.

VISCOSITY INDEX IN LUBRICATING PROBLEM

(Continued from Page 93)

lower consumption than Oil A. Incidentally, the viscosities at 0° F., estimated by analogy with the experimental data in Table 3, show that probably it would not have been possible to start the cars with Oil A at that temperature, even though this oil had the lower viscosity at 210° F.

Other influences of viscosity index on lubrication problems concern the stability of lubricating oils at high temperatures, the ease of shifting of transmission levers at low temperatures, the losses of oil and grease by leakage, and the oiliness of lubricants as regards the coefficient of friction. These various influences have previously been discussed to some extent in the literature cited[4, 21, 24] and the above discussion is presented merely as an indication of the importance of viscosity index rather than as a complete study of all its applications to the problems of automotive lubrications.

Literature Cited

[1]A.S.T.M., Report of Committee D-2 on Petroleum Products, p. 243 (1931).

[2]Becker, J. Soc. Automotive Eng., 28, 292 (1931).

[3]Blackwood and Rickles, J. Soc. Automotive Eng., 28, 236 (1931).

[4]Davis and Blackwood, Ind. Eng. Chem., 23, 1452 (1931).

[5]Davis and McAllister, Ind. Eng. Chem., 22, 1326 (1930).

[6]Dean and Davis, Chem. Met. Eng., 36, 618 (1929).

[7]Ellis, "Hydrogenation of Organic Substances," p. 577, D. Van Nostrand Co. (1930).

[8]Haslam and Russell, Ind. Eng. Chem., 22, 1030 (1930).

[9]Lane and co-workers, Bureau of Mines R. I. No. 3129 (1931).

[10]Larson and Schwaderer, Nat. Pet. News, 24, 26 (1932).

[11]Mougey, J. Soc. Automotive Eng., 29, 200 (1931).

[12]Newell, Ind. Eng. Chem., 23, 843 (1931).

[13]Sloane and Smith, data pending publication, Standard Oil Development Co., research laboratories (1931).

[14]Sullivan and co-workers, Ind. Eng. Chem., 23, 604 (1931).

[15]Winning, private communication, Standard Oil Development Co., research laboratories (1930).

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MELLON INSTITUTE PUTS COAT OF FELT ON STEEL

Felt-coated steel, said to be adapted for the manufacture of pipe and numerous other products, is announced by the Mellon Institute of Industrial Research, Pittsburgh, Pa. The new laminated metal was developed by Dr. A. W. Coffman, who says that by the use of alloys hitherto alien materials are made an integral part of the steel, on one or both sides.

The alloys are heated to something just beyond their "plastic" points, the temperature at which they become soft, before turning into a true liquid. In that stage and above alloys of tin, lead, and zinc amalgamate with the linings. Exactly the right cooling is necessary for success. The coatings mostly experimented with thus far are asbestos and cellulose.

Without rupture of these linings, says the report, the steel has been corrugated, cut with the ordinary tools of a tinsmith, rolled into pipe and even "drawn." A cellulose-coated piece of steel was elongated 8 per cent by cold rolling.

"This metal," says Doctor Coffman's report, "affords flexibility of protection against a variety of corrosive agencies, a fact that will no doubt create many uses other than as roofing and siding for building construction. Excellent pipe line protection should be provided. Paneling for a large number of purposes, fireproof material for fire doors and the manufacture of novelties also come within the scope of possible applications."

NEW VIBRATING SCREENS

Two new types of vibrating screens have been announced by the Link-Belt Co., Philadelphia, Pa. One of these screens is a positive-drive type, heavy-duty vibrating screen, made with both single and multiple decks. The other is an unbalanced-pulley type, heavy-duty vibrating screen, made with single and multiple decks. These two additions are designed to meet needs where large screen openings are required and heavy capacities must be handled.

A.P.I. AT WELLSBORO

WELLSBORO, Pa., Mar. 28.—The eastern chapter of the Division of Production of the American Petroleum Institute, will meet in Wellsboro May 13-14.

Dr. J. French Robinson, chairman of the eastern division and manager of the Lycoming Natural Gas Corp., said the members would inspect the new gas fields in northern Pennsylvania and southern New York.

FRANK F. MURRAY DEAD

Frank F. Murray, 71 years old, a pioneer oil country newspaper and trade journal editor, died in Titusville, Pa., on March 18 after a six months' illness. For years he owned and edited the Petroleum Gazette, a monthly oil publication in Titusville. In the course of his life he saw service on the Pittsburgh Commercial-Gazette, the Titusville Herald, Titusville World and Oil City Blizzard.

EXTINGUISH FIRE IN WELLS

NEW YORK, Mar. 28.—The long-smoldering fire in the oil wells sunk from the Burbach Co.'s Volkenroda mine in Germany has been extinguished, and production has been resumed. I. G. Farbenindustrie's Leuna works are taking all of the production from the Volkenroda mine, which during 1931 produced 52,000 tons of crude.

DEATH OF WESLEY D. MARTIN

Wesley D. Martin, aged 40 years, purchasing agent and manager of the service division of the Arkansas Natural Gas Corp., died on March 17 in Shreveport, La. The funeral and burial were conducted in Bartlesville, Okla., former home of the deceased. Mr. Martin had been affiliated with Cities Service companies for many years.

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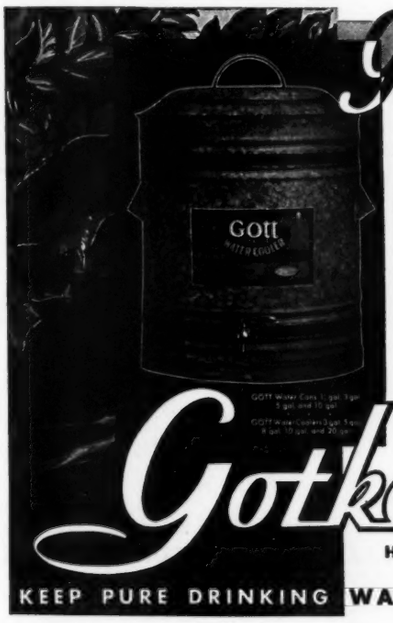

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CLASSIFIED SECTION

Oklahoma-Kansas and Eastern Pipe Line Report

OKLAHOMA-KANSAS
Pipe Line Statement for January

Runs

	Month (bbls.)	Dy.av. (bbls.)
Prairie P. L. Co.*	579,700	18,700
Gulf P. L. Co.	1,524,401	49,174
Texas P. L. Co.	543,721	17,539
Magnolia P. L. Co.	1,579,836	50,963
Empire P. L. Co.	2,010,159	64,844
Cosden P. L. Co.	613,381	19,786
Stanolind P. L. Co.*	3,162,000	102,000
Oklahoma P. L. Co.	2,069,871	66,770
Other lines	4,774,000	154,000
Total January	16,857,069	543,776
Total December	19,796,955	638,611
Difference	2,939,886	94,835

Shipments

Prairie P. L. Co.	1,862,334	60,075
Gulf P. L. Co.	1,792,661	57,828
Texas P. L. Co.	643,195	20,748
Magnolia P. L. Co.	965,558	31,147
Empire P. L. Co.	1,870,655	60,344
Cosden P. L. Co.	688,035	22,195
Stanolind P. L. Co.	3,335,755	107,605
Oklahoma P. L. Co.	2,091,388	67,464
Other lines*	3,007,000	97,000
Total January	16,256,583	524,405
Total December	19,255,129	624,359
Difference	3,098,546	99,953

Stocks

	Bbls.
Prairie O. & G. Co.*	35,341,000
Gulf P. L. and Gypsy Oil Co.	7,726,629
The Texas Company	3,664,036
Magnolia Petroleum Co.	8,474,950
Empire P. L. Co.	4,739,405
Mid-Continent Petroleum Corp.	3,331,484
Stanolind Crude Oil Pur. Co.*	16,250,000
Oklahoma P. L. Co.	1,278,698
Carter Oil Co.	6,161,513
Other lines*	15,166,000
Total January	102,124,015
Total December	102,072,265
Difference	52,700

*Estimated.

EASTERN PIPE LINE REPORT FOR MONTH OF FEBRUARY

Runs from Wells

In the following table will be found the regular receipts from wells by various pipe lines in New York, Pennsylvania, West Virginia, Ohio, Kentucky, Illinois, Indiana and Michigan for January and February:

	Jan., '32	Feb., '32
Nat. Transit	132,346.95	126,753.33
S. W. Pa. P. L.	64,883.40	58,939.34
Eureka P. L.	264,733.46	242,556.95
Buckeye P. L. (Macksburg)	221,436.17	220,174.62
Buckeye P. L. (Cleveland)	12,765.55	10,650.06
Buckeye P. L. (Lima, etc.)	70,902.03	69,769.97
Indiana P. L.	2,957.69	2,432.39
N. Y. Transit	42,434.50	42,479.85
Tide Water P. L.	21,527.15	23,346.91
Pure Oil	343,184.55	291,502.56
Stoll Oil Ref.	61,955.78	60,332.05
Bradford Tran.	469,404.66	358,619.95
Ashland Ref.		101,901.07
Total	1,658,531.92	1,609,459.55
Daily avg.	53,501.03	55,498.61

Petroleum Deliveries

The following table exhibits the shipments or regular deliveries in New York, Pennsylvania, West Virginia, Ohio, Kentucky and Indiana for January and February:

	Jan., '32	Feb., '32
Nat. Transit	546,544.24	521,574.03
S. W. Pa. P. L.	327,706.71	393,740.87
Eureka P. L.	266,908.78	284,915.43
Buckeye P. L. (Macksburg)	247,543.60	197,422.31
Buckeye P. L. (Cleveland)	1,710.80	1,468.37
Buckeye P. L. (Lima, etc.)	1,483,164.35	1,356,890.69
Indiana P. L.	720,776.96	684,053.57
Southern P. L.	45,091.84	29,866.72
N. Y. Transit	160,691.41	164,942.57
Northern P. L.	167,659.81	149,660.95
Tide Water P. L.	582,162.04	573,538.58
Pure Oil	322,591.72	323,613.38
Bradford Tran.	604,570.61	252,933.43
Tuscarora	305,988.46	291,210.02
Total	5,783,109.33	4,925,830.92
Daily avg.	186,551.91	169,856.24

Gross Stocks

The gross stocks held by various pipe lines in the oil-producing sections of New York, Pennsylvania, West Virginia, Ohio, Indiana and Kentucky at the close of January and February:

	Jan., '32	Feb., '32
Nat. Transit	708,300.22	714,820.78
S. W. Pa. P. L.	452,222.36	404,242.41
Eureka P. L.	1,218,191.97	1,260,183.19
Buckeye P. L. (Macksburg)	265,000.88	286,436.07
Buckeye P. L. (Cleveland)	88,126.48	47,411.90
Buckeye P. L. (Lima, etc.)	2,936,848.21	2,956,771.37
Indiana P. L.	520,692.84	513,552.31
Cumberland P. L.	64,500.81	
Southern P. L.	258,415.32	241,444.27
N. Y. Transit	198,406.61	195,495.84
Northern P. L.	334,194.85	306,733.15
Tide Water P. L.	974,418.35	863,042.42
Pure Oil	887,330.61	889,617.38
Tuscarora	10,920.81	10,806.74
Bradford Trans.	156,443.22	238,781.30
Total	9,023,914.45	8,974,350.13
Decrease	95,118.08	49,564.32

Grades of Oil

The following table shows the amount of the different grades of oil held by the Eastern pipe lines at the close of January and February, showing gross stocks of the above fields:

	Jan., '32	Feb., '32
Penna.	3,219,630.21	3,178,872.84
Lima	602,805.09	599,253.26
Kentucky	74,908.32	10,011.59
Mid-Continent	4,306,150.37	4,329,220.63
Illinois		22,550.52
Michigan	820,420.46	834,401.29
Total	9,023,914.45	8,974,350.13

Daily Average Runs

The following table shows the daily average runs of the Pennsylvania, Lima and Kentucky oil fields for the past four years:

	1929	1930	1931	1932
Jan.	51,749	75,907	53,939	53,501
Feb.	51,833	79,256	55,163	55,498
Mar.	54,252	76,688	54,331	.....
April	58,444	84,536	54,914	.....
May	59,902	70,546	53,344	.....
June	58,833	75,430	54,110	.....
July	66,087	68,921	50,723	.....
Aug.	66,087	54,291	51,503	.....
Sept.	67,315	56,595	61,345	.....
Oct.	76,093	58,179	65,595	.....
Nov.	74,831	52,332	59,819	.....
Dec.	74,561	53,999	61,835	.....

Daily Average Shipments

The following table gives daily average shipments from the Pennsylvania, Lima and other fields for the past four years:

	1929	1930	1931	1932
Jan.	165,721	217,623	175,369	186,551
Feb.	159,387	224,355	183,494	169,856
Mar.	161,474	228,846	189,503	.....
April	169,737	241,845	191,450	.....
May	184,281	248,383	199,247	.....
June	185,404	234,401	221,155	.....
July	194,763	207,094	211,632	.....
Aug.	194,946	205,506	224,166	.....
Sept.	201,314	193,999	217,537	.....
Oct.	191,867	157,675	210,831	.....
Nov.	202,745	146,638	196,425	.....
Dec.	186,257	143,001	176,241	.....

Gross Stocks

In the following table will be found the gross stocks of the various lines of the Pennsylvania, Lima and Kentucky oil fields, including oil received from other lines at the close of each month for the past three years:

	1930	1931	1932
Jan.	12,220,045	11,831,092	9,023,914
Feb.	12,991,561	11,506,489	8,974,350
Mar.	13,247,217	11,012,162	.....
April	13,223,961	11,044,481	.....
May	13,052,953	10,728,239	.....
June	13,396,855	9,903,349	.....
July	13,268,562	9,569,849	.....
Aug.	13,047,051	9,192,457	.....
Sept.	12,812,018	8,492,431	.....
Oct.	12,437,553	8,417,694	.....
Nov.	11,851,380	8,830,386	.....
Dec.	11,761,952	9,119,032	.....

The Illinois Field

The following table gives the report of the Illinois Pipe Line Co. in Illinois:

Gross stocks, March 1	549,565.81
Runs from wells	459,214.59
Regular deliveries	186,010.30
Other deliveries	207,879.43

The amount of Illinois oil run by the Tide Water Pipe Co. in February was 23,346.91 bbls. Deliveries were none. Adding these figures to those of the Illinois Pipe Line Co. makes the runs and deliveries as follows:

1932—	Runs	Deliveries
January	500,177.13	246,634.10
February	482,561.50	186,010.30
1931—		
January	468,429.04	669,573.19
February	429,284.54	461,262.85
March	424,638.23	356,663.26
April	421,814.98	282,532.65
May	433,231.80	322,513.95
June	510,805.78	320,258.13
July	520,009.38	289,219.05
August	476,623.56	393,231.06
September	492,183.83	323,012.50
October	498,124.13	325,834.95
November	470,302.63	281,258.48
December	515,771.28	306,623.19

Tide Water Pipe Co., Ltd., also delivered in February, 496,060.73 bbls. of Oklahoma oil.

AVERAGE DAILY IMPORTS OF CRUDE AND REFINED OIL AT PRINCIPAL UNITED STATES PORTS

Average barrels per day in 1931—	Atlantic Ports: Baltimore	Boston	New York	Philadelphia	Others	Total	Gulf Coast Ports: Galveston	New Orleans, Baton Rouge	Port Arthur, Sabine Pass	Tampa	Total	Total all ports
February	31,321	16,929	127,786	31,714	26,857	234,607	4,536	11,571	.....	536	16,643	251,256
March	27,645	18,935	141,169	26,299	21,129	235,161	4,065	2,580	.....	1,968	8,613	246,774
April	35,000	10,533	105,000	29,767	35,533	215,833	2,733	3,400	.....	.....	6,133	221,966
May	30,129	8,774	107,000	25,452	26,710	198,065	.....	2,000	.....	.....	2,000	200,065
June	30,067	10,833	111,767	27,000	30,833	200,500	3,300	5,500	2,167	1,333	12,300	212,800
July	26,387	11,226	104,678	29,323	21,773	193,387	6,903	7,419	4,194	.....	18,516	211,903
August	32,613	15,581	91,742	23,387	25,741	188,064	4,161	2,516	.....	3,162	9,839	197,903
September	27,067	7,267	106,867	30,099	22,967	184,267	4,833	8,333	.....	.....	13,166	197,433
October	53,710	14,484	100,774	26,742	40,645	236,355	6,097	6,871	2,097	1,838	16,902	253,258
November	48,033	28,800	51,667	25,600	12,967	170,067	3,933	10,833	3,033	1,367	19,166	189,233
December	20,258	16,806	121,807	31,645	34,258	224,774	1,968	4,355	.....	.....	6,323	231,097
January	19,161	8,161	104,065	24,194	34,903	190,484	4,871	7,226	2,096	1,484	15,677	206,161

AVERAGE DAILY RECEIPTS OF CALIFORNIA CRUDE AND REFINED OIL AT ATLANTIC AND GULF PORTS

Average barrels per day in 1931—	Atlantic Ports: Baltimore	Boston	New York	Philadelphia	Others	Total	Gulf Coast Ports: Galveston	New Orleans, Baton Rouge	Port Arthur, Sabine Pass	Tampa	Total	Total all ports
February	5,787	2,713	29,143	4,000	5,750	47,393	.....	.....	.....	.....	3,750	51,143
March	10,032	1,611	21,258	7,324	8,774	49,129	.....	.....	.....	.....	6,355	55,484
April	5,133	.....	19,200	16,500	10,067	50,900	.....	.....	.....	.....	4,000	54,900
May	4,452	3,064	19,903	11,226	6,258	44,903	.....	.....	.....	.....	2,355	47,258
June	4,267	.....	25,100	6,333	3,500	39,200	.....	.....	.....	.....	.....	39,200
July	6,774	1,194	24,612	11,065	9,902	53,548	.....	.....	.....	.....	1,335	54,903
August	3,452	.....	16,419	7,419	4,290	31,580	.....	.....	.....	.....	968	32,548
September	4,267	3,667	12,933	4,699	7,367	32,933	.....	.....	.....	.....	4,000	36,933
October	2,355	1,129	19,290	16,709	9,323	48,806	.....	.....	.....	.....	3,323	52,129
November	1,000	.....	22,800	11,567	.....	35,367	.....	.....	.....	.....	3,366	38,733
December	3,161	.....	27,484	8,839	6,032	40,516	.....	.....	.....	.....	7,742	48,258
January	3,871	1,710	14,483	3,774	5,710	29,548	.....	.....	.....	.....	.....	29,548

GROSS PRODUCTION OF CRUDE OIL IN THE UNITED STATES FOR 12 MONTHS

(In Barrels of 42 Gallons)

		California	Oklahoma	Texas	Kansas	Arkansas	Louisiana	Rocky Mts.	Eastern	Total
1931—										
February:	Month	14,936,932	13,531,930	18,967,571	3,341,016	1,402,492	1,981,616	2,747,024	3,129,000	60,021,631
	Daily average	533,248	483,285	677,057	119,322	50,089	70,772	98,108	111,750	2,143,629
March:	Month	16,364,842	14,927,687	22,453,619	3,498,598	1,469,245	2,061,676	2,898,035	3,274,000	66,747,602
	Daily average	527,898	536,377	724,310	112,858	47,395	66,502	92,485	105,629	2,217,665
April:	Month	15,803,541	16,815,990	26,887,717	3,281,886	1,412,220	2,008,021	2,901,870	3,273,000	72,384,239
	Daily average	526,785	559,255	896,257	109,396	47,074	66,934	96,729	109,100	2,412,808
May:	Month	16,448,960	17,333,867	28,708,654	3,341,366	1,446,274	2,232,568	3,098,419	3,190,000	75,800,128
	Daily average	530,612	559,157	926,086	107,786	46,654	72,018	99,949	102,900	2,445,166
June:	Month	15,641,436	16,678,200	28,139,833	3,175,440	1,344,450	1,850,511	2,936,200	3,166,000	73,932,070
	Daily average	521,381	555,940	971,327	105,848	44,815	61,684	99,540	105,533	2,466,069
July:	Month	16,093,333	16,420,080	33,827,213	3,089,832	1,387,585	1,715,730	2,905,909	3,241,000	78,680,671
	Daily average	519,139	529,680	1,091,200	99,672	41,535	55,345	93,739	107,774	2,538,078
August:	Month	15,668,984	9,517,279	32,279,516	3,141,322	1,165,569	1,584,444	2,807,143	3,167,000	69,331,558
	Daily average	505,451	307,009	1,041,284	101,333	37,599	51,111	90,553	102,161	2,236,503
September:	Month	15,130,610	7,946,880	28,981,525	3,147,080	1,128,280	1,641,284	2,761,230	3,632,000	64,429,039
	Daily average	566,026	264,896	966,051	104,901	37,946	54,713	92,041	121,067	2,150,966
October:	Month	15,651,982	12,951,893	30,725,173	3,177,046	1,172,289	1,822,255	2,797,597	3,900,000	73,198,356
	Daily average	504,903	417,803	991,134	102,486	37,819	58,782	90,247	125,807	2,328,979
November:	Month	14,997,700	16,430,730	28,860,561	3,131,679	1,130,700	1,851,577	2,706,390	3,639,000	72,748,338
	Daily average	499,923	547,691	962,018	104,389	37,690	61,719	90,213	121,300	2,424,946
December:	Month	15,560,984	16,598,299	27,767,651	3,198,642	1,082,148	1,971,817	2,816,759	3,648,000	73,641,300
	Daily average	501,967	535,429	903,860	103,182	34,908	63,607	90,863	117,581	2,343,268
1932—										
January:	Month	15,532,141	13,695,986	25,744,105	3,169,347	1,064,385	1,696,017	2,822,023	3,566,000	67,290,004
	Daily average	501,037	446,806	830,455	102,237	34,335	54,710	91,033	115,037	2,170,645
Total 12 months		187,875,435	174,549,831	334,333,468	38,693,210	15,115,837	22,417,516	34,348,599	41,022,000	848,354,946
Daily average		514,727	478,219	915,979	106,009	41,413	61,418	93,831	112,389	2,323,986

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The OIL and GAS JOURNAL

PRODUCING REFINING PIPELINE ENGINEERING MARKETING

Published Every Thursday TULSA, OKLAHOMA, MARCH 31, 1932

ANN ARBOR MICHIGAN

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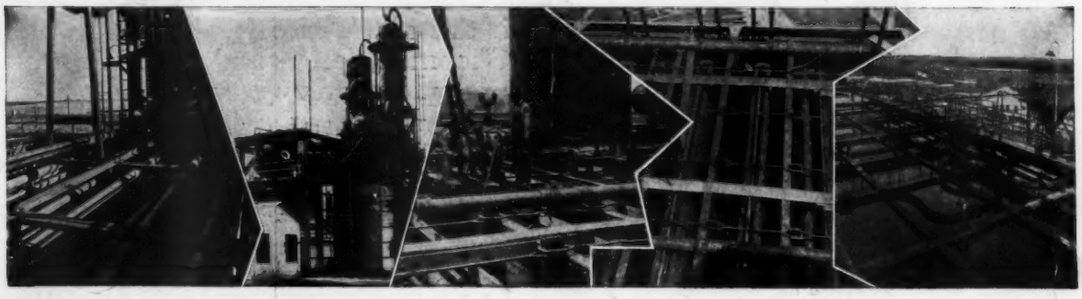
Acipco

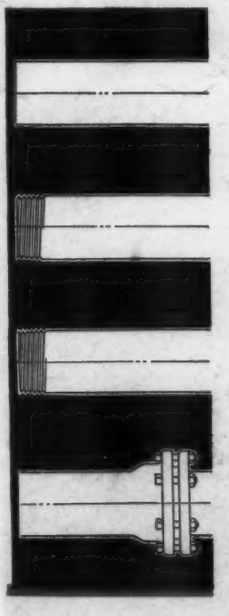
• MONOLOY

cast iron

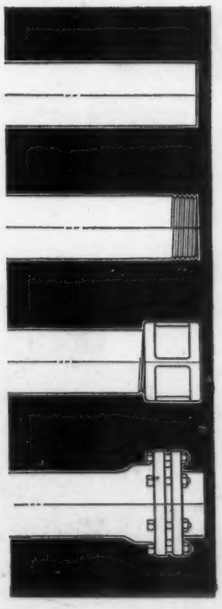
PIPE

Endures In Refinery "Hot Spots"





MONOLOY is light weight, high strength cast iron pipe that introduces the desirable factor of *permanence* into pipe installations in and around refineries. It is made to standard steel and wrought iron pipe outside diameters, in thicknesses approximating extra strong steel or wrought iron pipe; standard thicknesses guaranteed for safe working pressure up to 250 pounds. It is furnished with plain ends, threaded ends, threaded ends with couplings, and the Monoloy Doublex Simplex Joint as shown in drawings. Cast from regular iron or special alloy iron to suit your requirements. Threads, cuts, drills and taps perfectly with standard tools. Diameters 3″ - 12″ inclusive are cast against sand by the Mono-Cast centrifugal process in 16-foot lengths; diameters 1¼″ - 2½″ are furnished in standard 5-foot lengths; fusions welded lengths up to 40 feet. Monoloy Pipe is now successfully serving under widely varying conditions in and around many prominent refineries. Address nearest Acipco office for details, quotations, etc.



AMERICAN CAST IRON PIPE CO.

BIRMINGHAM, ALABAMA

SAN FRANCISCO CHICAGO KANSAS CITY
DALLAS MINNEAPOLIS LOS ANGELES
NEW YORK CITY SEATTLE CLEVELAND

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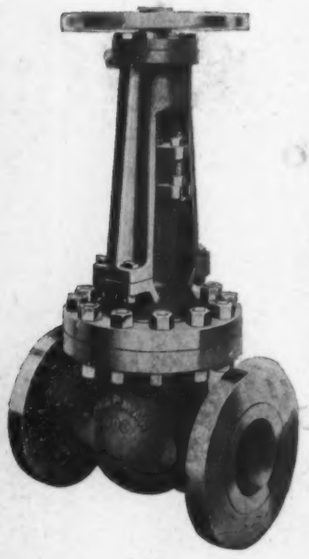
Advertisers' Index on Page 15 Table of Contents on Page 16

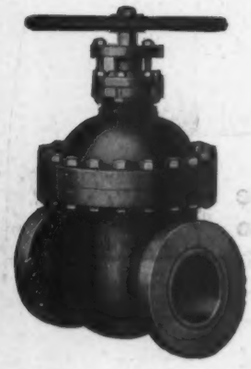
Depend upon it . .

. . if it is marked CHAPMAN



The REFINERY VALVE

Favored equipment where refinery processes demand the ability to withstand the most extreme conditions.



The PIPE LINE VALVE

Sure and trouble-proof where absence of breakdown is essential.

The NEW PLUG COCK

The plug has a vertical as well as a lateral movement. It turns with ease, and seats with positive contact — all with a single continuous movement of the stem.

Refinery engineers who specify Chapman valves or fittings, know they are planning to work with equipment which will surely measure up to expectations. This is a valuable assurance for the responsible man, especially when handling exacting processes or difficult conditions. The experienced engineer takes it for granted that the Chapman product will make good.

Nor is this all. There is also the certainty that Chapman design and research are up-to-the-minute in every respect—in fact, often set the standard. For instance, Chapman Chrome Tungsten Steel, developed in the Chapman laboratories, which has driven farther back the physical limits which engineers have been forced to observe, and has vastly increased the service life of equipment built of it.

And now the latest Chapman development, the new lubricated plug cock, simple in operation, positive in its removal of those former causes of plug cock failure. Non-sticking, non-scoring, non-leaking, needing no grease seal, and thus applicable where high temperature is a condition.

Developments like these have given the Chapman name a reputation which the equipment invariably sustains in performance.

The Chapman Valve Manufacturing Co.
INDIAN ORCHARD, MASS.

Valves for the oil industry carried in stock at

Los Angeles—1725 E. Seventh San Francisco—508 Fourth St.
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Other Branch Offices: Pittsburgh Detroit Cleveland Atlanta Philadelphia Chicago Syracuse New York Boston

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The Chapman Valve Mfg. Co.,
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Send me full details about the CHAPMAN line of valves and fittings for refinery applications.

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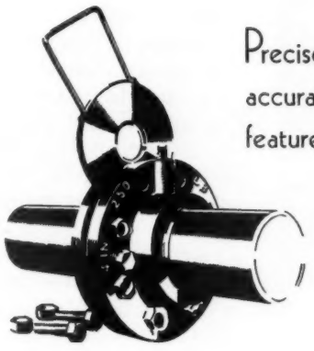
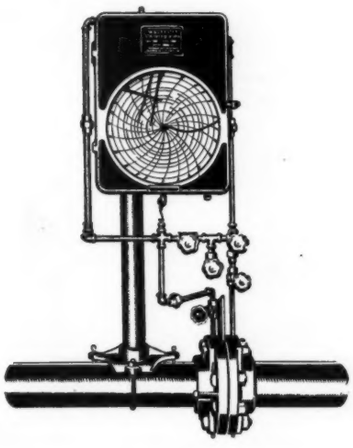
ACCURATE



Precise orifices, dependable meters, and accurate, legible records are prominent features of Westcott Orifice Meters.



ALL Metric Orifices are made of cold rolled steel (or other special metal if desired). They are machined accurately with an allowable tolerance of not over one thousandth of an inch. After machining, edges are honed so that they are sharp and free from any microscopic burrs or imperfections. Orifices are then tested with GO and NO-GO gages. Therefore, every orifice of the same diameter will pass the same quantity under the same conditions.

SIMILARLY, every detail in the design, construction, and inspection of Westcott Orifice Meters receives painstaking attention—from the uniform area of mercury chambers and the accuracy and sensitiveness of the recording pen, to keeping moving parts, and consequent maintenance, at a minimum.

A full discussion of the construction, operation and maintenance of Westcott Orifice Meters will be found in Handbook E-2. Positive Integration, a recently developed feature is explained in Bulletin E-16. A copy will be mailed on request.

METRIC METAL WORKS · *ERIE, PENNSYLVANIA*

IRONCASE, TINNED STEEL CASE and ORIFICE METERS

METERS METRIC

AMERICAN METER COMPANY

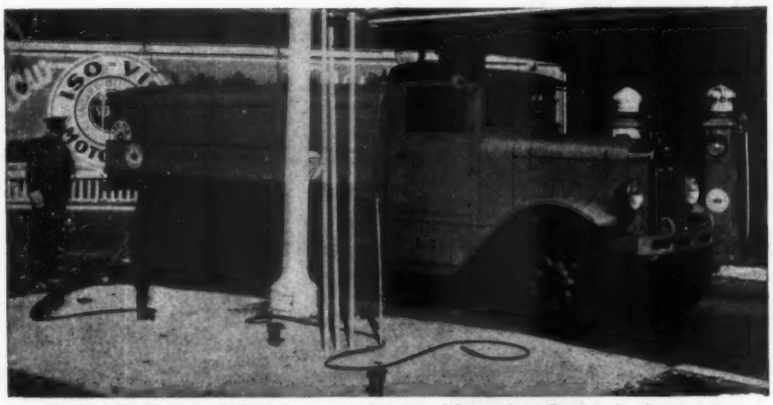
INCORPORATED

ESTABLISHED 1836

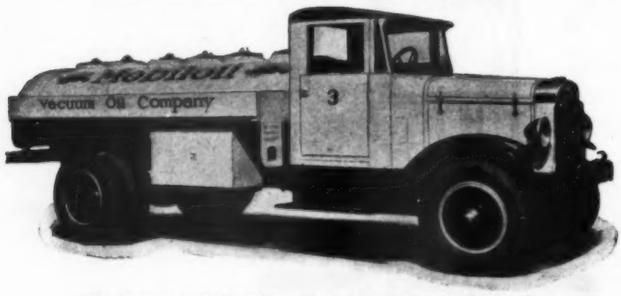
GENERAL OFFICES : 105 W. 40TH STREET · NEW YORK, N.Y.

The Oil and Gas Journal, issued weekly by The Petroleum Publishing Company, 114-116 West Second Street, Tulsa, Oklahoma. Subscription price $6.00 a year; 15 cents a copy. Entered as second-class mail matter December 15, 1911, at the post office at Tulsa, Okla., under the Act of March 3, 1879.

Producers, Refiners, and Distributors Save Money with Internationals



Standard Oil Company (Indiana) is an extensive user of International Trucks. Its fleet includes speed trucks and heavy-duty models like the one above.



This International Heavy-Duty Truck is one of a number in the service of Vacuum Oil Company.

Phillips Petroleum Company recently added this International Speed Truck to its fleet in Texas.

One of the International Speed Trucks with trailer tank at work in Chicago for the Cities Service Oil Company.

BY their ability to haul economically, International Trucks have established themselves in every division of the petroleum industry. Shown here are typical installations of Internationals in the refining and marketing divisions. These companies operate large fleets of Internationals. They, and hundreds of others in the industry, know International Truck economy and performance. They know that whether hauling costs are figured on a per gallon or per mile basis, Internationals can be depended on for minimum operating expense.

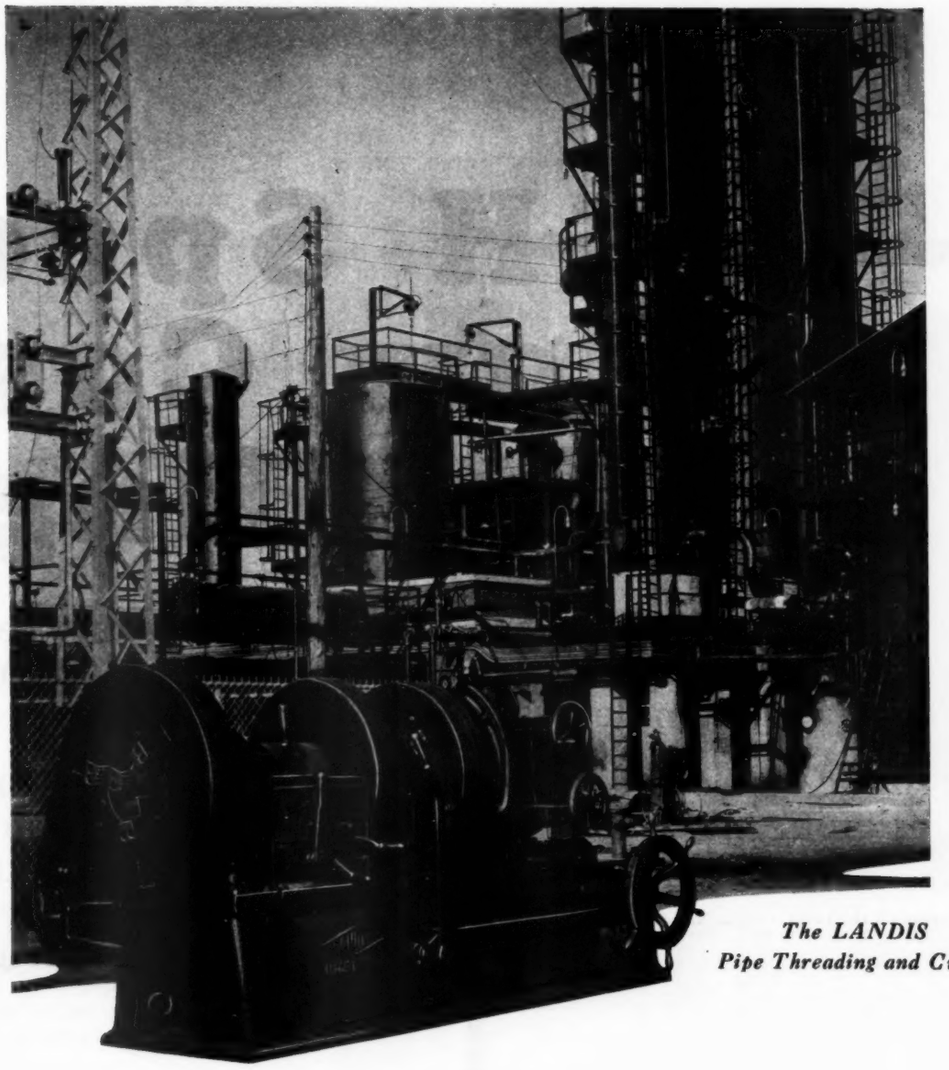
There are capacities and wheelbase lengths to meet your hauling needs and your equipment. Ask the nearest of 183 Company-owned branches in the United States and Canada or an International dealer for a demonstration. Sizes from ¾-ton to 5-ton. An important fact to remember is that International service is always close at hand through the nation-wide network of Company-owned service stations.

INTERNATIONAL HARVESTER COMPANY
OF AMERICA
606 So. Michigan Ave. *(Incorporated)* Chicago, Illinois

The Magnolia Petroleum Company operates a large fleet of Internationals. This heavy-duty model is one of those put into service in Houston, Texas.

Part of the Standard Oil Company (Ohio) fleet of Internationals operating in the Cleveland area. The tractor-trucks are also used with 15-barrel stake body drays.

INTERNATIONAL TRUCKS



The LANDIS
Pipe Threading and Cutting Machine

LANDIS *for* THREADING

» LANDIS offers the one complete line of threading equipment--thread cutting machines, pipe threading machines, thread cutting die heads and collapsible taps for practically every threading operation. Our experience and manufacturing facilities are the best guarantee that Landis equipment will handle your threading jobs to better advantage.

Oil refiners have found that the Landis Pipe Threading and Cutting Machine is ideal for the construction or maintenance of refinery piping. This is because Landis Machines are accurate, speedy, flexible and economical.

Any Landis user will tell you that the Landis cut thread is leak-proof. Threads produced on a Landis Machine are smoothly finished and correct for form, lead and taper.

Then too, the Landis machine is geared for an unusually high range of threading speeds—it is extremely flexible in that setup changes can be made in a few seconds—and its tool cost is so low, due to the long life of the patented Landis chaser, that it will show a decided saving in piping costs.

Write today for literature.

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HIGH Speed Low Cost Drilling

This is what all producers are shooting at. Many years' experience with extensive drilling activities has revealed the following to the Humble Oil & Refining Company:

Although the cost of lubricating drilling equipment appears to be an insignificant item on the cost sheet of a rig and is frequently overlooked—costs due to improper lubrication can mount to immense proportions, through lost time and replacing of equipment. Humble lubricants are specially designed to meet the needs of the producer.

HUMBLE

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Humble Gas Engine Oils
Humble Diesel Engine Oils
Humble General Machine Oils
Humble Air Compressor Oils
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Humble Oil & Refining Company

HOUSTON, TEXAS

25-year-old problem
Solved

SINCE THE BEGINNING

of centrifugal pumps, stuffing box pressures and gland leakages have been a problem on high pressure models. Goulds research solved the problem with a new type of stuffing box. Here is how this was done.

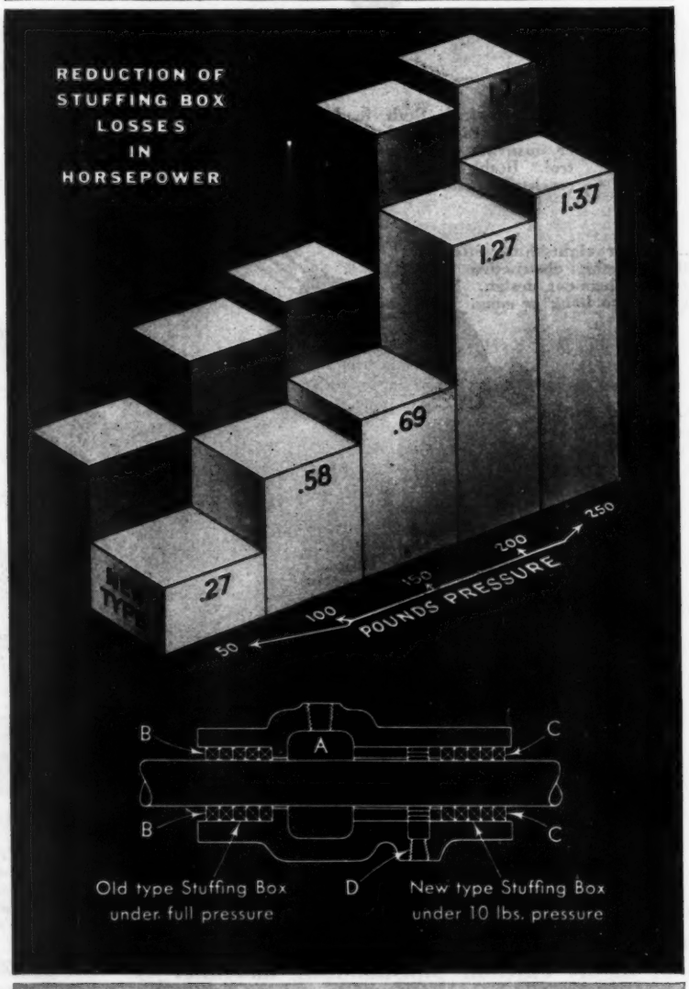
A testing device was built with a liquid pressure chamber in the center (A), with the old trouble-making type of stuffing box (B) on one end, and the new type (C) on the other.

B, subject to full pressure, requires tightly drawn gland to prevent excessive leakage. Tight gland results in: heating of box, scoring or excessive wear of shaft, or sleeves, shortened life of packing, loss of efficiency from leakage and friction.

Pressure in C is throttled and relieved through by-pass pipe (D). Pressures up to 250 lbs. were applied, but because of controlled by-pass, they never exceeded 10 lbs. in the new stuffing box.

Gland was run loose, greatly lengthening life of packing, and protecting sleeves and shaft. Efficiency loss was reduced and leakage loss was negligible.

Such research is a constant part of Goulds practice. It costs over $1500 weekly. To those buyers who recognize durability, reliability and economy of operation, as the important considerations in a pump purchase, it is a promise of continuously better performance! Goulds Pumps Inc., Seneca Falls, N. Y. Branches and agents in principal cities. World's largest makers of pumps exclusively.



$1500 A WEEK FOR BETTER AND BETTER PERFORMANCE

GOULDS
PUMPS

BIG RESULTS

Without Big Size

Safety Control—Both load line and boom line raise and lower under power, insuring safety and accurate control. Both levers within convenient reach of operator.

Compact—Counterweights hung effectively without being obstructive in close quarters. Clean-cut design. No protruding parts to hang or snag.

High Capacity—without stiffleg. Length of boom 10½ ft. Standard counterweight 1500 lbs.

Overhang	*Weight Lifted*
2 ft.	19,875 lbs.
4 ft.	8,980 lbs.
6 ft.	6,285 lbs.

Sturdy Boom—Heavy channels well reinforced. Entire boom assembly hot riveted and electric welded. Low sheave for lateral bends.

Full Vision—Operator has unobstructed view front and side. Natural hand-wheel steering.

Fine Balance—Motor unit does not overhang front of crawlers. Crawler frames, truck wheels and truck wheel bearings amply strong for maximum boom capacity. Plenty of clearance between all members for easy lubrication or adjustment.

THE result of years of experience and the active cooperation of leading pipe line contractors. A powerful and highly efficient pipe-handling machine. A carefully planned combination of the Model HI-30 Highway Pipe Boom and Model GH Trackson McCormick-Deering Crawler Tractor, joined into one sturdy, integral unit. Ideal size, weight and power for handling all sizes of pipe with greatest speed and least cost. Full vision for the operator. Safety lowering mechanism. No protruding parts to snag or hang on stumps or pipe. Handles easily in close quarters. Keeps within narrow right-of-ways. Low in first cost. Low in upkeep. Service points conveniently located over the entire country. Write for full details.

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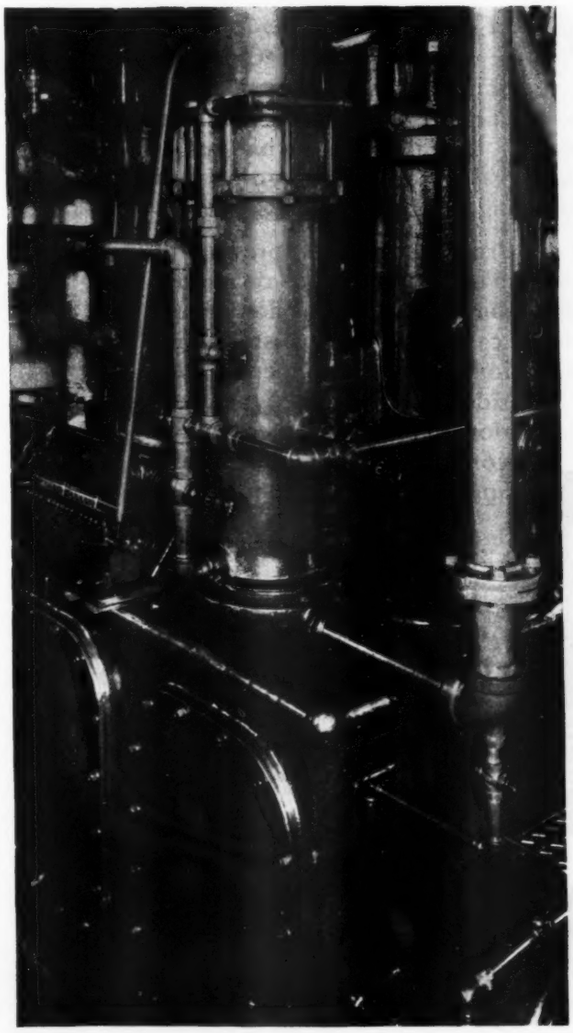
HIGHWAY TRAILER COMPANY
Edgerton • Wisconsin

This Diesel Plant *SOUGHT TROUBLE-FREE* performance . . .



found lower oil-costs, too

Repair and maintenance costs were running high in this Diesel-engine power plant. Power pistons had to be cleaned frequently. Piston-rings stuck in their grooves.

In seeking a way to eliminate these troubles, the plant engineer called in a Vacuum representative who, after studying plant conditions, recommended the proper grades of Gargoyle D.T.E. Oils.

Savings soon became apparent. Repair and maintenance costs fell. Frequent shut-downs for cleaning were eliminated.

That was all the plant engineer had been seeking. But it wasn't all he found. Here's another substantial saving the records revealed:

Cost of competitive lubricant per 1000 k.w.h.	$2.06
Cost of Gargoyle D.T.E. Oils per 1000 k.w.h.	.686
Saving per 1000 k.w.h.	1.37
Annual saving (90,000 k.w.h. per month) . .	$1,483.92

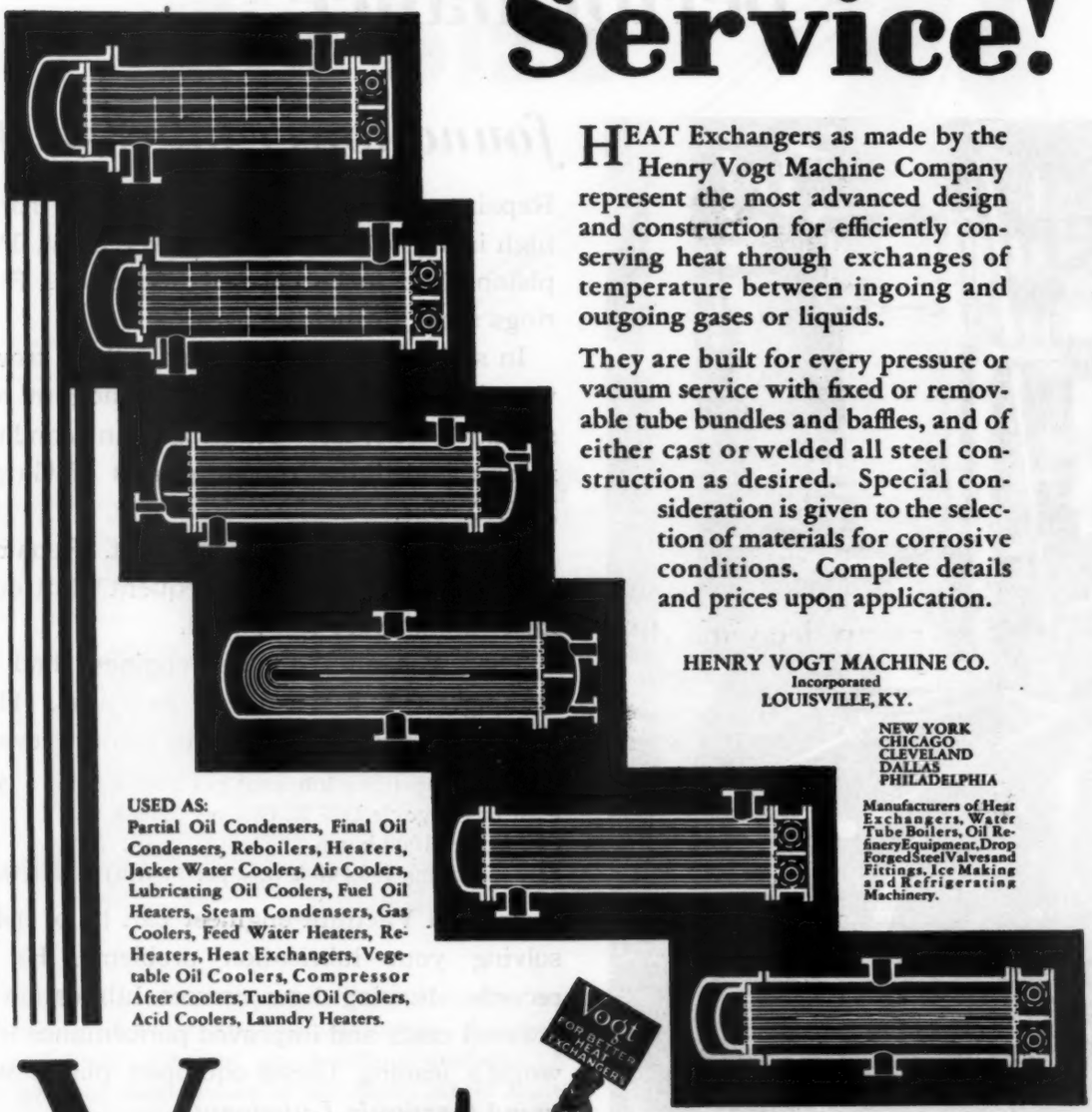
Perhaps a Vacuum engineer can be of help in solving your lubrication problems. He has records showing how correct lubrication has lowered costs and improved performance in the world's leading Diesel-equipped plants when *using Gargoyle Lubricants.*

GARGOYLE Lubricating Oils

VACUUM OIL COMPANY, INC.

61 Broadway, New York City. Branches and warehouses throughout the world.

a Type for *every* Service!



HEAT Exchangers as made by the Henry Vogt Machine Company represent the most advanced design and construction for efficiently conserving heat through exchanges of temperature between ingoing and outgoing gases or liquids.

They are built for every pressure or vacuum service with fixed or removable tube bundles and baffles, and of either cast or welded all steel construction as desired. Special consideration is given to the selection of materials for corrosive conditions. Complete details and prices upon application.

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CHICAGO
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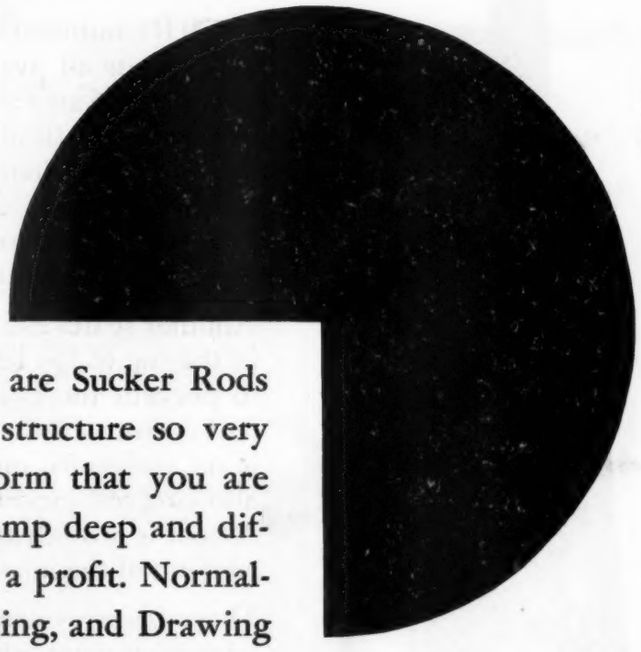
Manufacturers of Heat Exchangers, Water Tube Boilers, Oil Refinery Equipment, Drop Forged Steel Valves and Fittings, Ice Making and Refrigerating Machinery.

USED AS:
Partial Oil Condensers, Final Oil Condensers, Reboilers, Heaters, Jacket Water Coolers, Air Coolers, Lubricating Oil Coolers, Fuel Oil Heaters, Steam Condensers, Gas Coolers, Feed Water Heaters, Re-Heaters, Heat Exchangers, Vegetable Oil Coolers, Compressor After Coolers, Turbine Oil Coolers, Acid Coolers, Laundry Heaters.

Vogt HEAT *Exchangers*

PROFIT *by this*
REVOLUTIONARY ADVANCEMENT IN *SUCKER ROD* MANUFACTURE



Actual photomicrograph (100X) of grain structure after "Oilwell's" *Triple Treatment* to combine Strength, Toughness and Ductility.

Here, at last, are Sucker Rods with a grain structure so very fine and uniform that you are enabled to pump deep and difficult wells at a profit. Normalizing, Quenching, and Drawing are the *Triple Treatment* stages of refinement that make these Rods stronger, tougher and more ductile—enabling them to lower your lifting costs.

"OILWELL'S"

Triple Treatment

OIL WELL SUPPLY CO.
Branch Stores in all Oil Fields
SUBSIDIARY OF UNITED STATES STEEL CORPORATION

1932

"OILWELL"

FEATURES of

The BREWSTER *Automatic* CORE BARREL

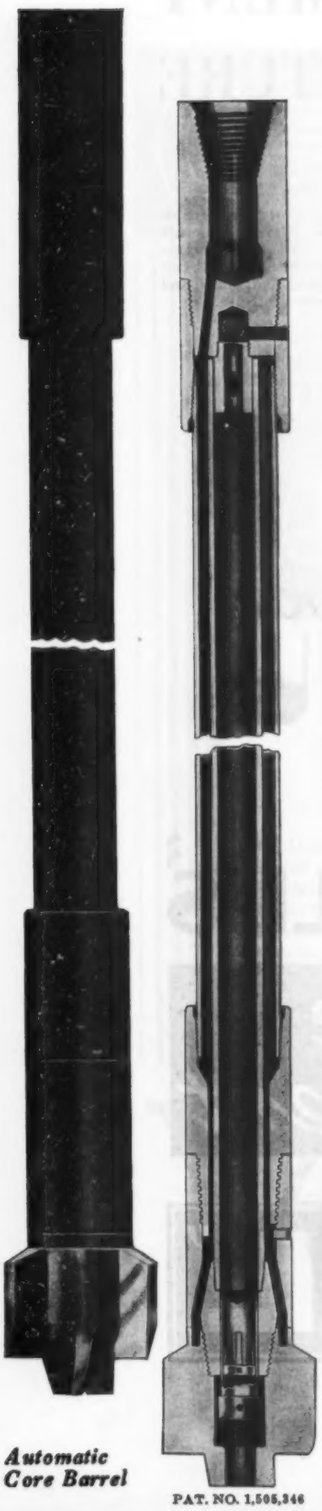
THE automatic feature consists of a means of washing the inner barrel clean. The water is allowed to pass through this barrel until all foreign substances are washed out; when the operation of coring begins the ports in the inner barrel are automatically closed, allowing the fluid to pass around the inner barrel to the bit.

Another feature is the position of the valve in the top of the barrel, which is arranged to prevent the pressure from holding the ball down, so that in soft sand coring there is no resistance on the inner barrel, thus allowing soft sand cores to enter the barrel. A vent is provided to allow fluid and air to pass out of the inner barrel.

These features are very desirable and fill a long felt want where soft sand and other coring is necessary.

In either soft or hard formation a full recovery is assured. Made in all sizes and any length.

This barrel is equipped with split liners the same as Type C and Type M barrels.



Automatic Core Barrel

PAT. NO. 1,505,346

Core Barrel Equipped With Roller Bit.

Type "M" Cutter Head

The Brewster COMPANY~INC.

Shreveport, Louisiana

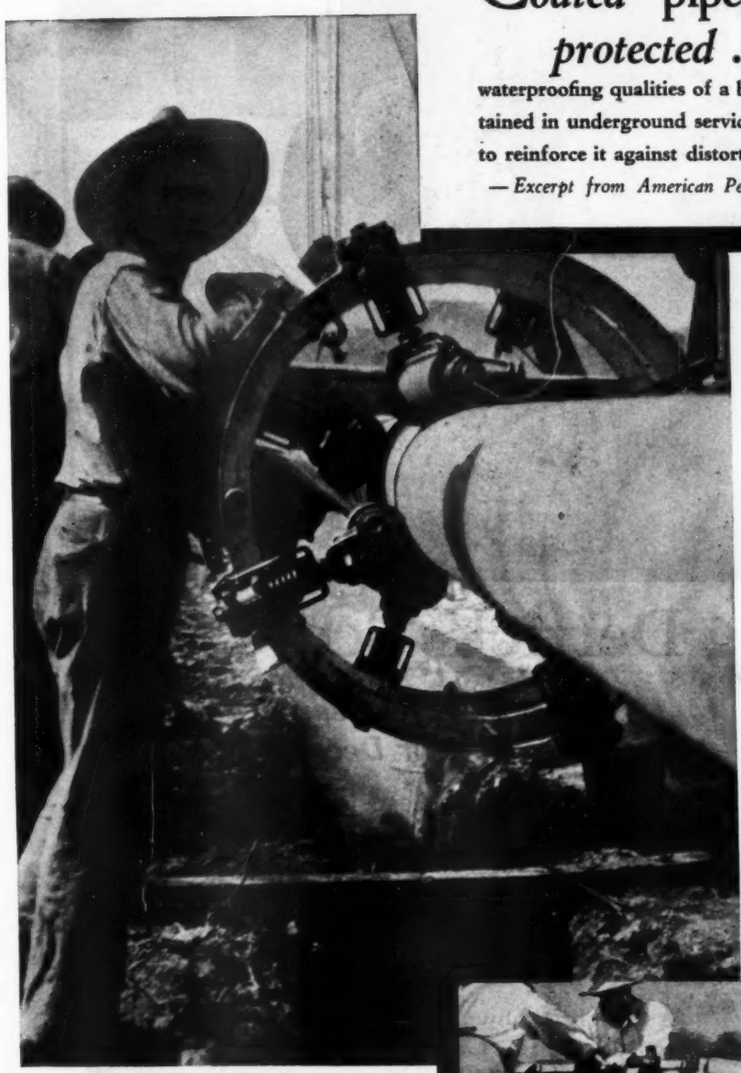
Warehouses: The Iverson Specialty Co., Oklahoma City, Oklahoma, Phone 2-2833; The Brewster Houston Store, 2000 Harrington Street, Capitol 2031.

Export Distributors: Acme Well Supply Company, Inc., 136 Liberty St., New York City.

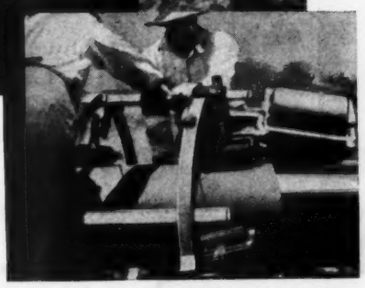
"Coated" pipe is only partially *protected* . . .

"The full effect of the waterproofing qualities of a bituminous material cannot be obtained in underground service unless some means is employed to reinforce it against distortion and abrasion."

— *Excerpt from American Petroleum Institute Proceedings, 1927.*



Wrapping J-M Asbestos Pipe Line Felt over hot coating on a 10-in. welded line with the J-M rotary-type field machine. Note the smooth, uniform application. Up to a mile and a quarter per day can be wrapped by this machine.



For complete *security against corrosion* . . .

Wrap your Pipe!

BY distributing the clod pressure — by taking the sheer and pull of soil action that destroys unprotected coatings, Johns-Manville Asbestos Pipe Line Felts add years of extra service to oil and gas lines.

The wrapping of J-M Asbestos Felts adds to the waterproofing provided by the bitumen coating. It successfully guards against electrolytic and galvanic action. It provides the pipe line with an armor of lasting protection that costs but a fraction of the cost of reconditioning.

In the last 20 years more than 10,000 miles of line have been protected by J-M Asbestos Pipe Line Felts. They can be applied by hand or by machine — in the field, at the pipe mill or in the yard.

You should know the full story of the economy of *complete* protection for pipe lines. The figures speak for themselves. Our booklet — "Safeguarding Your Pipe Line Investments" — will be sent on request. Address our local office or Johns-Manville, 292 Madison Ave., New York City.

JM Johns-Manville

ASBESTOS PIPE LINE FELTS

Parkersburg Derricks Score Again

—with Two Remarkable Records for Deep Drilling

ILLUSTRATED above is the Preston Culp 6, owned jointly by the Mid-Kansas Oil & Gas Company and the Ramsey Petroleum Corporation. This remarkable test, drilled with a Parkersburg Derrick to a depth of 10,079 feet, has the distinction of being the deepest well ever drilled in the United States.

At the left is shown the Parkersburg Derrick on the record-breaking Cable Tool Test being drilled by the United Fuel Gas Company, near Spencer, W. Va. This test has attained a depth of 9,101 feet and is the world's deepest cable tool drilled well.

To the owners, contractors and crews of both tests, the Parkersburg Rig & Reel Company extends its heartiest congratulations.

The Parkersburg Rig & Reel Co.

Executive Offices and Main Plant

Parkersburg, West Virginia, U.S.A.

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PRESTON OIL CO. CONTROLS TREATING

...cuts handling costs with...

HTH

THE PRESTON OIL COMPANY
COLUMBIA SYSTEM

Homer, Ohio.
March 3, 1932.

The Mathieson Alkali Works, Inc.,
250 Park Avenue,
New York, N. Y.

Gentlemen:

For several years we have used chlorinated lime to sweeten gasoline. This commodity we found efficient, for our purpose, chemically, but being bulky, we found same hard to handle and store economically with a great lot of sludge left after the treatment.

Through a personal call of your district sales manager and supervision of tests by our chemist, we have found a very agreeable solution to our problem and that is by using H T H. We find it everything it is rated - a superior product for the convenient and accurate preparation of hypochlorite treating solutions.

We thank the Mathieson Alkali Works for their research work and look forward to further progress and cooperation in all our associated business projects.

Very truly yours,

THE PRESTON OIL CO.

Chief Engineer.

P.S. You have my permission to use any part or all of the above letter as you wish.

L.D.M.:C

● By using HTH for sweetening gasoline, the Preston Oil Co. has solved a difficult control problem that has troubled many producers of gasoline and other distillates. At the same time this refiner has improved treating conditions and reduced maintenance and handling costs.

Because of its exceptionally low free-lime content, HTH produces clear hypochlorite treating solutions that are uniform in treating efficiency. No large amount of sludge is left to cause frequent cleaning out of apparatus . . . to cause corrosion and scale in mixing valves. HTH is quickly soluble, free-flowing and mixes into solution readily. It is easy to store . . . because of its high concentration, requires less storage space. It shows no appreciable loss of strength, winter or summer.

Let us send you helpful literature and quote prices on HTH.

The MATHIESON ALKALI WORKS (Inc.)
250 Park Avenue, New York, N. Y.

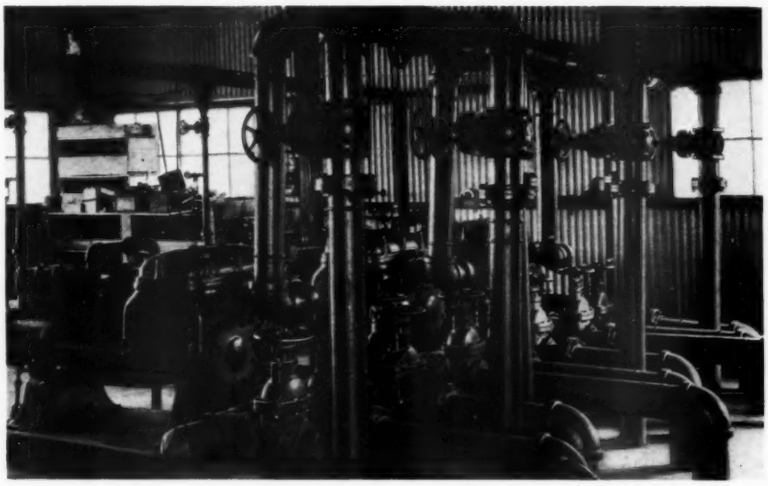
Soda Ash; Caustic Soda; Bicarbonate of Soda; HTH (Hypochlorite); Liquid Chlorine, Bleaching Powder; Ammonia, Anhydrous and Aqua; PURITE (Fused Sodium); Solid Carbon Dioxide

(The Mathieson Alkali Works, Inc., is the sole licensee on the North American continent for the Hypochlorite process of refining petroleum.)

Other Applications of* HTH *in the Petroleum Industry

- **Algae control, pipe lines**
- **Algae control, sand filters**
- **Algae control, refrigerating units**
- **Algae control, steam condensers**
- **Algae control, distillate condensers**
- **Sterilizing water supplies, wells, etc.**
- **Disinfecting and deodorizing sewage effluents, toilets, etc.**
- **General sanitation of every description.**

HTH-Technical is shipped in 110- and 200-lb. drums and is available from warehouse stocks throughout the United States. HTH for sanitary and other special uses is supplied in cases of one dozen 4-lb. cans.



One thing less to worry about— *when the Valves are* KENNEDY

YOU can be sure of tight closure, quick release, and dependable operation with Kennedy Valves. Their bodies are designed with a generous safety factor, their disc mechanisms are simple, sturdy and positive, their stems are tough and resilient, and their hand wheels provide ample leverage for easy manipulation.

Kennedy Iron Body Gate Valves are made in 400-lb., 700-lb., 1000-lb. and 1600-lb. test pressure patterns and also for lighter pressures and extreme pressures. The extensive Kennedy line also includes iron body globe, angle and check valves, as well as bronze valves, for a large range of pressures.

By standardizing on Kennedy you are therefore assured of a dependable source of supply for *all* your requirements in the refinery, in the field, and on pipe lines. Kennedy Malleable Iron Screwed Pipe Fittings, and Standard and Extra-Heavy Cast Iron Flanged Fittings, too, are thoroughly reliable and meet every requirement of the oil industry.

Kennedy Products are obtainable from your local supply house. If you will write for a copy of the Kennedy catalogue, we shall be glad to tell you where you can obtain Kennedy Valves and Pipe Fittings in your locality.

Each Kennedy Valve is individually tested to a pressure far higher than that for which it is sold. The experienced Kennedy Testing Corps is entirely independent of the Production Department and their sole duty is to detect imperfections. They pass only valves which are perfect in every respect.

The Kennedy Valve Mfg. Co., Elmira, N. Y.

Representatives in principal oil centers.

KENNEDY

VALVES~PIPE FITTINGS~FIRE HYDRANTS

Timken Bearings for Pumping Dependability

Here is a photograph of the latest type Lufkin Giant Pumping Power on the Hunt Lease in East Texas Field. This unit contains 6 Timken Bearings. The main shaft is mounted on two 12" bore bearings, the thrust end of the worm is carried on two 7½" bore bearings and the crank shaft is equipped with two 8" bore bearings. 3 Dodge-Timken pillow blocks on the drive shaft assure friction-free power transmission. This pumping power is now handling 8 wells, averaging 3,600 feet in depth. The Timken Roller Bearing Company, Canton, Ohio.

TIMKEN *Tapered Roller* **BEARINGS**

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the largest Atmospheric-Vacuum Still ever built.

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General Sales Offices: PITTSBURGH, PA.

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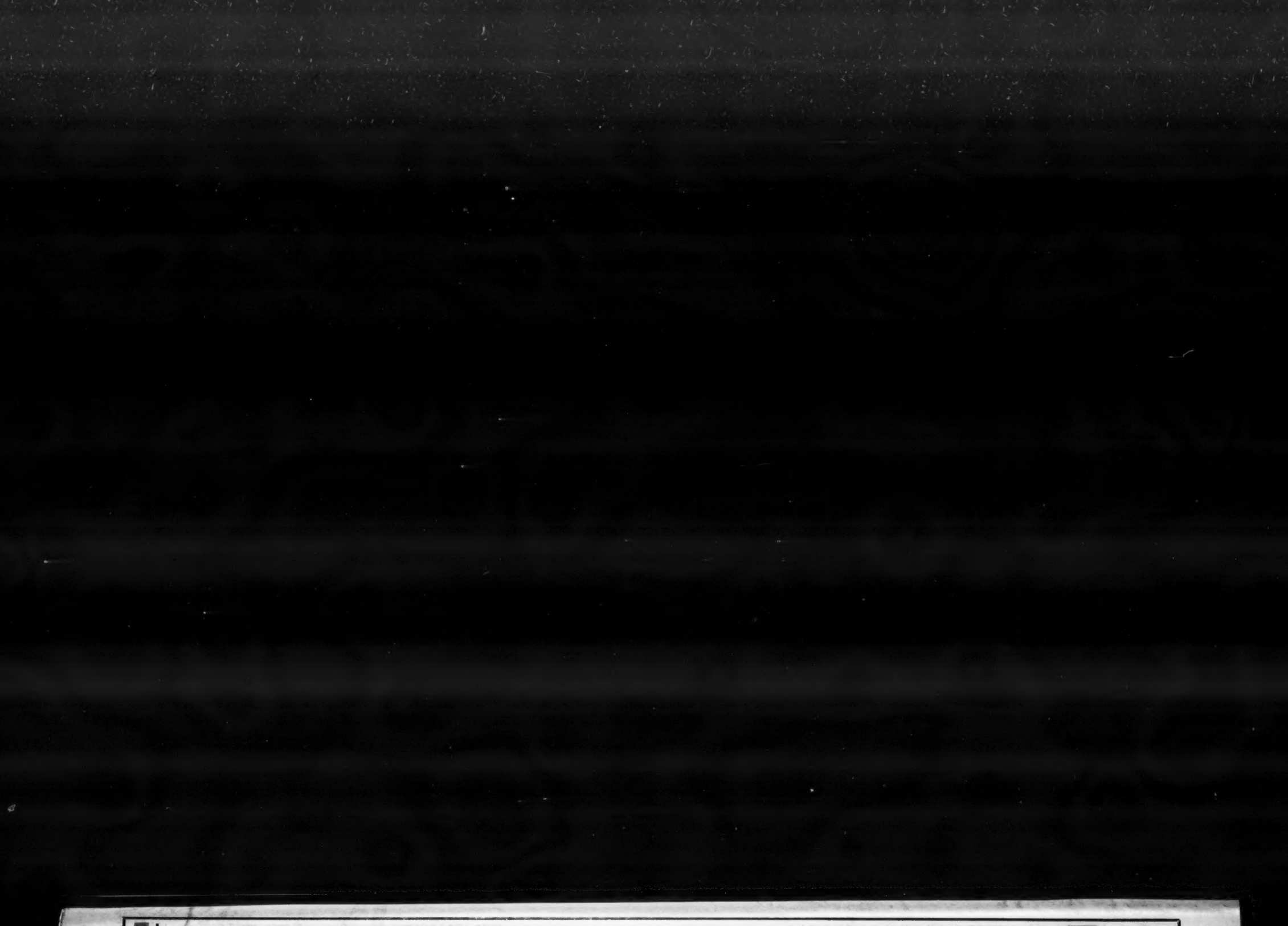
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